VOLUME TWENTY-TWO

AMERICAN JOURNAL OF PHARMACEUTICAL EDUCATION

S P R I N G

NINETEEN HUNDRED FIFTY-EIGHT

AMERICAN JOURNAL of PHARMACEUTICAL EDUCATION

VOLUME 22 SPRING, 1958 NUMBER 2

MELVIN R. GIBSON
EDITOR

GEORGE L. WEBSTER
BUSINESS MANAGER

PUBLICATION COMMITTEE

HAROLD G. HEWITT, CHAIRMAN, EXECUTIVE COMMITTEE, AACP
UNIVERSITY OF CONNECTICUT

GEORGE L. WEBSTER, SECRETARY-TREASURER, AACP
UNIVERSITY OF ILLINOIS

MELVIN R. GIBSON, EDITOR
STATE COLLEGE OF WASHINGTON

Published quarterly by the American Association of Colleges of Pharmacy, partially supported by the American Foundation for Pharmaceutical Education, and printed by the State College of Washington Press at the State College of Washington, Pullman, Washington. Subscription price $5.00. Single copies $1.25. Reentered as second class matter February 15, 1956, at the post office at Pullman, Washington, under the act of August 24, 1912.

Editorial office: School of Pharmacy, State College of Washington, Pullman, Washington. Address all communications concerning manuscripts to the Editor. Instructions to authors will be found in the announcement section of each Winter issue. Business office: College of Pharmacy, University of Illinois, 833 South Wood Street, Chicago 12, Illinois. Address all subscriptions and other business communications to the Business Manager. All new subscriptions begin with the Winter issue. The Journal assumes no responsibility for statements made by authors.

AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY -- 1958-1959

OFFICERS

LOUIS C. ZOPF, PRESIDENT	STATE UNIVERSITY OF IOWA
CHARLES W. BLIVEN, VICE PRESIDENT	GEORGE WASHINGTON UNIVERSITY
GEORGE L. WEBSTER, SECRETARY-TREASURER	UNIVERSITY OF ILLINOIS
HAROLD G. HEWITT, CHAIRMAN, EXECUTIVE COMMITTEE	UNIVERSITY OF CONNECTICUT

EXECUTIVE COMMITTEE*

HAROLD G. HEWITT, CHAIRMAN	UNIVERSITY OF CONNECTICUT
P. A. FOOTE, 1959	UNIVERSITY OF FLORIDA
E. E. LEUALLEN, 1959	COLUMBIA UNIVERSITY
LOUIS W. BUSSE, 1960	UNIVERSITY OF WISCONSIN
EWART A. SWINYARD, 1960	UNIVERSITY OF UTAH
THOMAS D. ROWE, PAST PRESIDENT	UNIVERSITY OF MICHIGAN
LOUIS C. ZOPF, PRESIDENT	STATE UNIVERSITY OF IOWA
CHARLES W. BLIVEN, VICE PRESIDENT	GEORGE WASHINGTON UNIVERSITY
GEORGE L. WEBSTER, SECRETARY-TREASURER	UNIVERSITY OF ILLINOIS

HONORARY MEMBER

ZADA M. COOPER	VILLISCA, IOWA

---

* Specification of a year after the name of a member of the Executive Committee indicates the year in which the term of office terminates at the time of the annual meeting.

CONTENTS

FEATURE SECTION

Research in the Pharmaceutical Industry Today, *Ernest V. Volwiler* 127
Clinical Research in the Pharmaceutical Industry, *Raymond M. Rice* 133
Value of Foundations to Pharmaceutical Education, *Lloyd E. Blauch* 139
The Application of Group Thinking Techniques to the Problems of Pharmaceutical Education, *Lee H. Bristol, Jr.* 143
The Bobst-Columbia Plan for Pharmaceutical Education, the First Application of Group Ideation to Curriculum Development, *Leo Roon and E. E. Leuallen* 147
Changes Influencing the Teaching of Pharmacy in the United States, *Tom D. Rowe* 151
Pharmaceutical Education in the United States, *H. G. Hewitt* 155
A New Plan for Pharmacy Education, *Glenn L. Jenkins* 165

ARTICLES

Studying Pharmacy in West Germany, *Glenn Sonnedecker* 169
A Course in Pharmacy Orientation, *C. Lee Huyck* 179
The English Teacher Talks Back, *Chester L. Riess* 185
A Five Year Grade Study of Pharmacy Students in the Courses Pharmaceutical Calculations and Introductory Pharmacy, *Henry M. Burlage* 193
The Canadian Conference of Pharmaceutical Faculties, *G. R. Paterson* 201
How Can We Train for Industry?, *Robert V. Evanson* 210
The Development of Pharmacy in Poland, *Witold Saski* 214
Antibiotic Testing, *Raymond W. VanderWyk* 227
Graduate Enrollment Data, September, 1957 and Graduate Study in Member Colleges for 1958-1959, *Richard A. Deno* 233
Report of the Delegate to the AAAS, *John M. Cross* 235

EDITORIAL 237
MEMORIALS 240
NEW LITTLE PEOPLE 248
MARRIAGES 248
STAFF CHANGES 248
GENERAL NEWS 250
BOOK REVIEWS 255
NEW BOOKS 267

AUTHORS IN THIS ISSUE

Ernest H. Volwiler, President and General Manager, Abbott Laboratories (Ph.D. University of Illinois; Honorary Degrees: D.Sc. Miami University, Northwestern University, Philadelphia College of Pharmacy and Science, LL.D. Coe College, Knox College)

Raymond M. Rice, Executive Director of Medical Research, The Lilly Research Laboratories (M.D. University of Nebraska)

Lloyd E. Blauch, Assistant Commissioner for Higher Education, United States Office of Education (Ph.D. University of Chicago)

Lee H. Bristol, Jr., Director of Public Relations, Bristol-Myers Products Division (A.B. Hamilton College, L.T.C.L. Trinity College of Music (London), HH.D. (honorary) Los Angeles Conservatory of Music and Arts)

Leo Roon, Chairman of the Board of Trustees, Columbia University College of Pharmacy (M.S. New York University)

E. E. Leuallen, Dean, College of Pharmacy, Columbia University; Member AACP Executive Committee (D.Sc. Philadelphia College of Pharmacy and Science)

Tom D. Rowe, Dean, College of Pharmacy, University of Michigan; Past President AACP (Ph.D. University of Wisconsin)

H. G. Hewitt, Dean, School of Pharmacy, University of Connecticut (Ph.D. University of Wisconsin)

Glenn L. Jenkins, Dean, School of Pharmacy, Purdue University (Ph.D. University of Wisconsin)

Glenn Sonnedecker, Director of the American Institute of the History of Pharmacy and Associate Professor of Pharmacy History, University of Wisconsin (Ph.D. University of Wisconsin)

C. Lee Huyck, Professor of Industrial Pharmacy, St. Louis College of Pharmacy and Allied Sciences (Ph.D. University of Florida)

Chester L. Reiss, Assistant Professor and Chairman of the Department of English, Brooklyn College of Pharmacy (M.A. New York University)

Henry M. Burlage, Dean, College of Pharmacy, University of Texas (Ph.D. University of Washington)

G. R. Paterson, Director of the Canadian Academy of the History of Pharmacy and Associate Professor of Pharmaceutical Chemistry, University of Toronto (Ph.D. University of Wisconsin)

Robert V. Evanson, Associate Professor of Pharmacy Administration, Purdue University (Ph.D. Purdue University)

Witold Saski, Associate Professor of Pharmacy, University of Nebraska (Phar.D. University of Bologna, Italy)

Raymond W. VanderWyk, Associate Professor of Pharmacognosy and Biology, Massachusetts College of Pharmacy (Ph.D. Harvard University)

Richard A. Deno, Professor of Pharmacognosy, University of Michigan (Ph.D. University of Michigan)

John M. Cross, Professor of Pharmaceutical Chemistry, Rutgers—The State University (Ph.D. University of Maryland)

FEATURE SECTION

Editor's Note. The articles in this section were presented to the Plenary Sessions or the Section on Education of the Fourth Pan-American Congress of Pharmacy and Biochemistry, November 7-9, 1957, Washington, D.C.

RESEARCH IN THE PHARMACEUTICAL INDUSTRY TODAY

ERNEST H. VOLWILER

To be invited to address this fourth Pan-American Congress of Pharmacy and Biochemistry is indeed a pleasure. I am grateful to Dean Hewitt and his program committee for the opportunity to be a part of your plenary session. I feel that this Congress is playing, and will continue to play, an important role in stimulating international exchange of ideas and inspiration.

Carried forward as we are by the rapid progress of scientific knowledge, it is difficult to appreciate how far we have come in the field of medicinal chemistry and how quickly this progress has been made. It is hard to realize that only seventy-five years ago — and, incidentally, right here in Washington — the great Cuban scientist, Carlos J. Finlay, first enunciated the theory that yellow fever is transmitted by insects. The history of medicine records few more significant achievements than this piece of inductive reasoning by Dr. Finlay.

Not quite fifty years ago the world-renowned Dr. Carlos Chagas of Rio de Janeiro showed the relationship between the so-called "kissing bug" and the debilitating affliction we now know as Chagas disease. Only forty years ago the first school of tropical medicine in the Americas was founded in Puerto Rico. It has been less than a full twenty-five years since the first national institute for cancer research was established in Argentina. Latin America's truly great offensives against plague, yellow fever, and malaria have been effectively carried through within the lifetime of a number of men in this room. Yes, these are exciting times in which to live, exhilarating times in which to be a part of the scientific renaissance.

RESEARCH AND TECHNOLOGY

Since we are now living in an age of research and technology, the time has come when the economic and even the political policies of government must be shaped to a larger degree by scientific considerations.

A few months ago the American Political Science Association met here in symposium, bringing together students of the relationship between science and government. It was the consensus of this meeting that the President of the United States should have in his cabinet a science adviser who would be the head of a new Department of Science. This cabinet member, the association suggested, should be the chairman of a three-man commission which would be paralleled in Congress by a joint science committee of both houses. There is solid basis for this suggestion.

The need for good international scientific relations is demonstrated strikingly in the field of medicinal chemistry. Every man in this room is familiar with the classic reciprocal research relationship which made it possible to develop penicillin. During those strenuous years of World War II, the cooperative effort of free scientists resulted in more rapid applications of research than was ever made in any comparable period in history. Not only did the free world develop penicillin, we also made many other significant advances, among them dried blood plasma and its fractions, new antimalarials and a number of drugs for the control of other diseases.

Indeed, many of our most notable research advances of recent years have resulted from the orderly international exchange of information. Chlorpromazine, for example, was synthesized in France. Reserpine was isolated in Switzerland. The antimalarial, proguanil, was first introduced in England. So, too, was the trypanocide, antrycide. Germany produced analgesic drugs like pethidine and methadone. The United States, in turn, can properly claim credit for the development of many advances in chemotherapy, microbiology, and virology.

It is difficult for us to recall, now, that a very large proportion of today's medicinal agents were unheard of as late as 1925 — only three short decades ago. Of all the agents available at that time, not more than fifty were sufficiently uniform, potent, and effective to be of any use. Some declared that medicine could be practiced with just ten drugs — among them quinine, digitalis, alcohol, arsenic, insulin, epinephrine, strychnine, and iodine.

ACCELERATION OF PROGRESS

There are probably three fundamental reasons for the dramatic, worldwide forward march of medicinal chemistry during these past thirty years. One is that we have been able to define many therapeutic problems in chemical terms. The second is that we have developed means of measuring — both quantitatively and qualitatively — the activity of compounds in the human body. The third is that we can recognize more precisely what is needed.

Early in the present century, research workers talked of the relationship of chemical constitution to physiological action. That there is such a specific relationship, no one can seriously doubt. But the use of this principle in predicting the kind of new structure which will produce a desired therapeutic effect still remains more a wish than an accomplished fact. True, within certain patterns and in many homologous series, we can predict activity with some confidence; but in entirely new fields based solely on chemical and physical properties of new compounds such prediction is still not reliable. However, with the increasing use of the fine modern tools such as infrared spectrophotography, electrophoresis, x-ray diffraction, and chromatography, coupled with advanced physiologic and pharmacologic methods, we may expect real progress in predicting the effects of new compounds.

Industrial production in the United States has trebled during the past quarter century. During this time we have drawn heavily on the basic scientific knowledge accumulated through the thought and research of the preceding century. It has often been pointed out, but it bears repeating, that we are using up our basic knowledge faster than we are replenishing it.

The answer to this problem must come from several sources. Colleges and universities need further support, and it is particularly important that much of

their research be in the basic rather than the applied fields. Faculty salaries must be increased significantly so that our productive scholars will not be driven out of the academic fields by economic necessity. In addition to giving more financial support for higher education and research, industry will also find it necessary to carry on more fundamental research in its own laboratories. In the medicinal field, we need to learn more about *why* a drug produces certain effects as well as *how* it acts.

Finally, all of us expect government to play a definite role in the accumulation and development of new knowledge. However, there is a wide divergence of opinion on how much research should be done with government money. There is the ever-present danger of throttling free and competitive research by too much government support and control. It is thought in some quarters that a crash program, financed by government as in the case of the atomic bomb, is of necessity the quickest way to get results. I cannot subscribe to this premise. It assumes that money will solve and cure everything, but it overlooks the fact that government support and control in peacetime may not make for the most effective use of a limited supply of qualified scientists, and that independent competitive research in a free economy is often the best source of important results.

THE ORIGIN OF DRUGS

The public has been fascinated and encouraged by the rapid progress of recent years in the development of valuable new drugs. Some of these have come from research workers in universities and clinics; others have originated in the research laboratories of drug manufacturing firms. Very few so far have had their origin in government laboratories. At the manufacturers' level, sales of the United States ethical pharmaceutical industry will probably be about $1.7 billion in 1957. A study recently completed indicates that industry research expenditures this year will amount to $127 million, as compared with $110 million in 1956. These outlays represent a high percentage of the drug industry's income, and the expenditures are expected to increase both in total amount and as percentage of sales.

At the same time, our government outlays for medical research have risen even faster. Last year, in fact, 57 per cent of the total amount allocated by all sources came from the government. This year, Congress has increased the appropriation for medical research from $186 million to $220 million. Of this amount, approximately $58 million has been assigned for cancer research. Thus, one such government dollar out of four has been allocated for cancer. Is this the proper ratio? Is the program likely to lead to the desired results? Only time will tell. The National Institutes of Health deserve credit for the planning that led to the Cancer Chemotherapy National Service Center. This joint government-industry effort has posed many fundamental questions, not the least of which is the individual company's patent rights to the compounds it may develop. The National Institutes of Health have proposed an outline of a patent policy which still needs study and clarification.

It is planned that the studies to be undertaken under this program be, indeed, cooperative efforts. While NIH funds will pay the salaries of scientists working on the cancer projects in various laboratories, these men and women are nevertheless being diverted by their organizations from other research activities of a high priority. Too, the compounds employed in these studies are supplied from industry laboratories.

RESEARCH

I have pointed out that the drug industry is spending $127 million a year on research. This money is used to do three things: to discover drugs for diseases which cannot presently be treated effectively; to develop drugs which will treat a given condition better than any product presently available; and to find ways of reducing the costs of existing drugs. Discovery, obsolescence, and cost reduction are the three primary objectives. Ultimately, of course, the objective is to provide the best tools possible for the prevention and treatment of disease. To do this, the manufacturer must plow back a large share of his gross profits into further expanded research. Since hundreds of new compounds must be made and evaluated in order to find one that is a drug worth marketing, the risk in our industry is high, but this kind of risk-taking has given us an armament of effective drugs beyond the fondest hopes of a quarter century ago. Due to the chances involved and the rapid progress of the last twenty years, it is not certain that the recent pace of discovery can be regularly maintained. But broad research must go on, and this necessitates the allotment of adequate research capital by the drug manufacturer.

The research administrator of a drug company is a risk calculator; his success is largely dependent on how accurately he appraises his probabilities and how well he deploys his resources.

As E. Duer Reeves of Esso R. & E. explains it, a research program is something like a balanced investment portfolio. It should include some projects which involve minimal risk and are fairly certain to produce some economic benefits. The smaller the risk, however, the smaller the return. The balanced research program should also include a second kind of project, Reeves says, the "blue chips" that stand a fair-to-even chance of being successful. The research risk in these projects runs higher, and the rewards are commensurately greater. At the far end of the list are the long shots, the somewhat more speculative ventures in which both the risk and the reward are high.

This way of deploying research is not unique to the drug business. Indeed, it is present in industry generally. The factor which sets drug research apart, however, is the high degree of risk which is present in the laboratory every day of every year of every decade.

THE ROLE OF PATENTS

The patent system has played an important role in the development of new and improved drugs. This is significantly true in the United States. Our system, which permits patenting of new compounds as well as methods of production, has sometimes been questioned; but in operation the system has greatly encouraged research and risk-taking, and it has strongly catalyzed initiative and research. Countries which do not have an enlightened and strong patent system are bound to impede progress and to suffer in the long run. It is a matter of gratification that the countries in the Western Hemisphere generally recognize the contribution that a good patent system can make. In this country, we are fortunate in having a Patent Commissioner and staff who are forward-thinking people, whose purpose is to make our system still better. At the present time they are giving careful study to the question of the basic significance of animal data in a drug patent application. We of the drug manufacturing industry are of the strong belief that in many cases results of animal tests constitute an adequate basis for the granting of patents.

In a field which affects the lives of people so directly and importantly as the one with which this program is concerned, it is to be expected and desired that government should exercise certain regulatory functions. Our own Food, Drug and Cosmetic Law is a good example. Fortunately, it has been administered by a dedicated group of able men.

Pharmaceutical research is not a stranger to the bridle of government control. Nor has it often found its experience with the Food and Drug Administration either uncomfortable or unreasonable. Thirty or forty years ago the regulatory agencies needed to have little concern about the safety of drugs. For the most part, the drugs weren't sufficiently potent to do anybody very much harm, and perhaps not much good, either. Now, however, more and more drugs are being developed for the treatment of specific conditions, and these drugs are of increasing potency. Working cooperatively with the FDA, industry has properly assumed the burden of determining the safety of therapeutic agents.

As rapidly as possible, the research divisions of American drug companies are enlarging their facilities for clinical evaluation of compounds. It is estimated, incidentally, that quality control now assumes between 10 and 15 per cent of the pharmaceutical industry's manufacturing costs.

So long as the federal law is administered and obeyed scrupulously, the general public and the industry will continue to benefit. There is the ever-present danger, however, that the public and the industry could be the victim of an excess of administrative zeal. For example, the law empowers the Food and Drug Administration to rule on the safety of new drugs, not their efficacy. There are some who argue that the FDA cannot rule on the safety of a drug until the FDA is satisfied as to its efficacy. Yet, certainly the administration cannot put itself in the position of prejudging whether a drug will or will not prove of value in the treatment of disease. This, obviously, is something which the medical profession must ultimately decide.

THE COST OF DRUGS

The patient in this country who comes to the pharmacy to have his prescription filled may know little of research risk and costs. The significant thing for him should be that, year by year, he is getting a better bargain in medicinals.

First of all, what is he paying for his drugs? Many people have talked so much about $10 and $15 prescriptions that folks are surprised to learn that the average prescription costs only $2.74. Prescriptions costing $10 or more actually represent only one-half of 1 per cent of the total. This percentage, furthermore, has been declining. More than half of all the prescriptions filled in the United States during 1956 were for less than $2.

And what is the patient getting for his money? He is getting increasing value. His hospital stay is shortened; he recovers sooner, and he can return to productive work. Both he and the community have gained. This situation exists in all countries where modern drugs are generally available.

International cooperation in pharmacy and biochemistry among the nations of the Western Hemisphere has been fruitful and productive. Both Canada and the Latin American republics have contributed many notable men to these services. To encourage the development of such individuals, there must be strong colleges and universities to give them training and to provide the means and the climate for great teaching. Much needs to be done to strengthen the educational systems in each of our countries. We are accustomed to large expenditures for national

defense, for construction of public buildings and roads, for food and clothing, and for outright luxuries. It behooves us to divert a larger amount of our national income for the support of higher education.

In this direction, a good start, though too limited, has been made through the exchange of students from one country to another. Such procedures not only give opportunities for broader training, but they can do more to establish understanding and good will between nations than can be accomplished by most other means. I hope that the interchange of students will be greatly extended, and that each of our countries will allocate an increasing share of its income to the support of education in all its phases. To the degree that this is accomplished, our services concerned with the medicinal field will be able to contribute much more in the future.

The population of the earth is growing at an unprecedented rate. Each inhabitant has the hope of good health and freedom from disease. As workers in the drug field, it is our responsibility to do everything possible, as quickly as can be done, to meet the need for curative and palliative agents. The pharmacists and biochemists in the Western Hemisphere, working closely with the scientists in related fields, are accomplishing great things to advance the health status of all people on our globe. No channel of international communication offers such freedom as does scientific interchange. Chemical formulas are the same the world over. We can all gain satisfaction and stimulation from the evidences of close cooperation in these common efforts between the nations on this side of the world. Through meetings of this kind we can do much to pull aside the scientific curtains to help us see the way to a healthier world.

Others frankly say that the whole scheme of things is completely and entirely wrong and that something else must be found to cover the nakedness of our illiteracy instead of the threadbare garments that we now call education.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 245 (1937)

CLINICAL RESEARCH IN THE PHARMACEUTICAL INDUSTRY

RAYMOND M. RICE

In the early 1600's things were happening in pharmacy and medicine which had much to do with these professions as we now know them. In England, the King had officially recognized the College of Physicians and the Company of Barber-Surgeons. Medicine and surgery were becoming organized and respectable and were soon to be followed by pharmacy. In 1610, a bill was promoted in Parliament to create a Company of Apothecaries, separate and distinct from the Parent Company of Grocers which had until then held authority over trade in drugs and medicinal substances. This effort to establish pharmacy in its own right met with failure, but the apothecaries took action again through a different political maneuver and their Charter was granted in 1614 (Dale, *Brit. M. J.*, 2:423, 1957).

These events in the history of our professions would be of less interest if they did not coincide with other happenings which changed the approach to treatment of the sick from one based on medieval misinformation to one built upon experimental science. The year the Company of Apothecaries became a reality, Harvey was beginning to expose his newly found facts concerning circulation of blood, thus providing a great impetus to scientific investigation. His book, *Essay on the Motion of the Heart and Blood in Animals*, has been called the most important publication in medical history.

There followed three centuries of slow and difficult progress when anatomical, physiological, and pathological facts were becoming established but when few real advances were being made in medical treatment of the sick. Many of us came into a world where the life expectancy of a newborn child was considerably less than fifty years. How fortunate we are to have been here during the past three decades when more real medical advances have been made than in the previous three hundred years. Today, the newborn has a life expectancy of about seventy years, and we think as much about geriatrics as we do about pediatrics.

With an eye to history we often refer to the age of empiricism in medicine when most drugs were of botanical origin. Having been told that the *United States Pharmacopeia* in use in the 1880's described less than half a dozen synthetic medicinal chemicals, it seemed interesting to learn how the proportion between botanicals and chemicals stood at the beginning of our present bright era of therapeutic advancement. Examination of *USP X* which became official January 1, 1926, reveals a fairly equal number of each, with chemicals showing a modest majority over botanicals. Medicinal agents of biological origin are few in number in *USP X*. Advances in medicinal research become strikingly evident in *USP XIV* which became official, November 1, 1950. In a short twenty-five years almost half the botanicals had fallen from view while medicinal chemicals had increased in number by 33 per cent. Two and one-half times more biological drugs are listed in 1950 than in 1926. These changes also are reflected in the *Quarterly Cumulative Index Medicus*. Scientific publications listed for 1925 are contained in 1,061 pages while only twenty-five years later in 1950 there are two large volumes totaling more than 3,000 pages. What a tremendous increase in scientific effort we have seen since many of us began our professional careers.

Empiricism in medicine served a useful purpose for without it there would have been little improvement in care of the sick as the world waited for chemistry and biology to come of age, and they have indeed come of age! One of the medical men in our industry has made some interesting observations (Rice, J. B., *Military M.*, 120:193-197 [March], 1957). He notes that fifty years ago *Chemical Abstracts* printed 7,500 notations while last year the number of abstracts was more than ten times greater at 80,000. In 1918, single authors are credited with 45 per cent of published articles on chemistry, while in 1950 86 per cent were presented by teams of investigators. Here is evidence of the highly intensified research work of our time as well as the team approach which has become so highly developed in the search for new drugs.

We have few if any modern examples of an advance in therapy which has come about solely through the efforts of a single scientist or physician. The brilliant chemist who initiates a new approach through logical manipulation of structure or through thoughtful development of a biosynthesis has neither the inclination nor the scientific background to carry his discovery through to a finished product. Jenner seems to have done a one-man job with smallpox vaccine, and digitalis was introduced without much help by Withering, but in 1957 notable, single-handed medical disclosures happen only in the movies. Conversion of a chemical or biological discovery into something fit for human use in an ampule or bottle is usually the work of dozens of people who each in turn hands the results of his labors to the next in line.

The past thirty years have been good to pharmacy and medicine and to the pharmaceutical manufacturer who has kept pace with these changing times. In the pharmacy, we have seen a gradual shift from compounding of prescriptions by the pharmacist to the practice of dispensing finished prescription products provided by the manufacturer. This has been inevitable as more and more potent drugs have come into general use involving formulations which are critical and which often require use of complex equipment for their completion. Thus, a sort of partnership has developed between the components of the "health team," the manufacturer, the pharmacist, and the physician, each of whom complements the work of the others. This is a partnership which thrives on new advances, and new advances come only through research.

Discussions of research in the pharmaceutical industry often are divided as they are in your program today, into "research" and "clinical research." This may suggest that there is a sharp dividing line between the two, but in most instances this is not true. Ideally, research in the laboratories of the drug manufacturer proceeds step by step, with the efforts of one group dovetailing with or overlapping the next, to provide a continuous flow of new facts. Each step brings into play the scientific skills best suited to move a little closer to the application of a new therapeutic agent in treatment of the sick.

A new synthetic compound from the laboratory of the organic chemist often must be studied as to structure and identity by the physical chemist. The pharmacologist must demonstrate its potentially useful effects, as well as its adverse activity in animals, and the toxicologist must establish its safety and determine a dosage range which is without danger in human use. Only after these and many other investigations have been completed satisfactorily does the clinical investigator attempt to determine how and where the new compound may apply in therapy. The clinician stands at the end of the line. He usually is not a chemist or biologist but is trained in medicine. Perhaps this is the reason we separate

"research" and "clinical research" — just different people doing the work. In the pharmaceutical industry research may be directed along many courses including study of fundamental problems not related to new drugs. Most often, however, it involves search for a new therapeutic agent for some unyielding disease condition or development of a more active or less toxic compound to supplant an established drug. In considering each new research project, attention must be given to the soundness of the venture. Is the disease to be approached an important one from the standpoint of incidence, morbidity, or mortality? Are established treatment methods reasonably satisfactory? Are there good leads to be followed in search for a safer and more effective therapeutic agent? How much laboratory space and manpower will be required to pursue the project with reasonable hope of successful outcome?

Of all research workers, the organic chemist is the most productive in numbers of compounds. Through his manipulation of structure, by changing a group here or a side chain there, he makes a host of new chemical substances, each one a candidate for pharmaceutical screening. The biochemist makes his contributions, among them the multitude of products of fermentation. The biologist, who a few years ago had almost run out of things to do with the streptococcus, staphylococcus, and other well-known organisms, has gotten busy again in his study of viruses and the diseases which they produce.

The promising things from these scientific areas are passed on for screening to determine if effects are produced in animals which give promise of possible human application. Many new agents are tested, but few are chosen. Demonstration of interesting pharmacologic activity is the signal for renewed intensity of chemical work, broadened studies in a variety of animal species, and initiation of a program of toxicological studies. When all of these things are done many individuals have a finger in the pie, and, perhaps, the new therapeutic possibility with a background involving months of work may be handed to the clinical investigator for the first human studies.

In the United States every new medicinal agent must be approved by the Food and Drug Administration before it can be introduced into interstate commerce. Complete information must be provided concerning chemical composition, pharmacological effects, toxic potentialities, control procedures in production, and finally a convincing background of safe human use must be presented. Thus, the clinical investigator has his turn providing the final word concerning the new product, how and where it is to be applied in medical practice, and what is to be expected in the way of undesirable side-effects. How different this is from the days of the old botanicals when introduction of a new therapeutic agent into medicine most often was based on the simple testimonials of physicians or patients.

It has been interesting to examine one of the early medicinal specialties which was marketed in the 1880's. It contained six botanical ingredients which probably had more profound effect upon the physician who tried to pronounce their names than upon the patient who took the concoction. It was introduced in all good faith as an "alterative" and was particularly favored for treatment of syphilis. The clinical background consisted of forty-six testimonials, some from physicians who have been famous in American medicine, all of whom attested to the favorable response which they had observed in their patients. There were no objective observations but only clinical impressions. Today, in approaching the Food and Drug Administration with a new drug we would feel well fortified

with forty-six good clinical studies, but I fear the 1880 variety would not be acceptable.

What about clinical research in 1957? This is a small but growing specialty in medicine. In part, through the opportunities in the pharmaceutical industry, well-trained young men are being attracted to the business of investigating new drugs as clinical pharmacologists and research clinicians. One type of clinical investigator has been described by Ogilvie in this way (*New Zealand M. J.*, 52:319, 1953) "The research worker of the novels and the films is a brilliant young doctor, eating his soul out in general practice until a beautiful girl comes into his life and fires him with a desire for higher things. He sacrifices all his prospects and rents a shed where he toils all day among microscopes and retorts, returning at night dog-tired to his garrett and his girl friend. Within six weeks he has discovered the cause of cancer." Our research clinicians are quite a different breed. All who have close contact with the practicing medical profession realize that the man who is taught to care for the sick is not necessarily a trained research worker. Ideally, the clinical investigator is not responsible for the routine treatment of illness, but he must have access to patients in his particular field of interest who can be studied under well-controlled conditions for responses to drugs which can be measured objectively. He must know how to protect against bias through use of technics which withhold from him knowledge as to when the new drug is being given in comparison to established agents or to placebo medication. He must know statistics so that when his results are assembled he can determine whether or not they are significant. Most important of all he must be expert in considering potential toxicity. The first human dose of a drug is never given without toxicity studies in animals, usually in several species, for the mouse or rat may react to a drug in quite a different manner than the dog or monkey. The clinician must interpret these animal results in terms of human dosage. He must know, too, that variations in drug response occur in humans. For example, who would have guessed that ephedrine effectively dilates the pupil of the eye in Caucasians but does not do so in Chinese and Negroes.

Hidden toxicity is a constant source of worry to the clinical investigator. Many of you are familiar with the recent studies of Carbutamide, a compound capable of reducing blood sugar in certain diabetics when administered orally. Administration to a variety of animals for many weeks failed to reveal important toxic effects, and, even after the compound was used clinically for months, by experts in diabetes, it was regarded as a relatively innocuous drug. Since treatment of diabetes must be continued day in and day out, often throughout the lifetime of the patient, unusual care was taken in this clinical study by subjecting Carbutamide to a broad trial involving hundreds of practicing physicians and thousands of patients. Only with this wide experience did it become evident that the drug was capable of producing serious damage in a small percentage of the patients who were taking it, and Carbutamide was abandoned as an impractical agent for treatment of diabetics.

Rarely, a new drug may be studied extensively and accepted for general use only to find previously unrevealed toxicity. Some years ago, a very useful anticonvulsant was introduced for control of epileptic seizures. It had been developed with unusual caution and had a background of six years of clinical trial before it was marketed. During the first year of general use, a patient or two developed a liver disorder while under treatment, but this was thought to be due to a cause other than the drug. During the next year other cases appeared, and

finally it was evident that the compound was capable of producing liver damage in certain individuals. When this serious side-effect was known for certain, all stocks were recalled from the market, and the product was deleted.

Perhaps, you would like to trace a new drug from its first recognition in the laboratory to its application in medical practice. Let us see what research lies behind the antibiotic products which have done so much to eradicate infection. As you know, penicillin was the first of these revolutionary discoveries. It is one of our best anti-infectives, but it is not ideal in all respects. Penicillin has no effect against some of the common disease producers, and some patients may become sensitized so that they cannot be given the drug without danger of serious allergic reaction. In the early 1940's it was difficult to believe that the first widely useful antibiotic was the only one to be found. Many pharmaceutical manufacturers invested heavily in antibiotic research, and, during these past few years, discovery of chloramphenicol, the tetracyclines, and erythromycin is evidence of the effort expended in this field. Each one of these compounds has its shortcomings when judged as a perfect therapeutic agent, but each one has been a welcome addition to therapy as it makes us more secure against the pathogenic organisms which attack us.

Search for new antibiotics begins in the laboratory of the microbiologist. Samples of soil are his main source of new organisms, and from these bits of earth thousands upon thousands of microbes have been cultured and screened. Ever present is the hope that one may be found which, in its metabolism, produces a substance which kills or prevents the growth and multiplication of disease-producing germs. When such an organism is discovered, it is encouraged to multiply in artificial medium to provide amounts of its anti-infective substance adequate for laboratory testing. The spectrum of antibacterial effect is determined in the hope that pathogenic bacteria not susceptible to previously known antibiotics will succumb when exposed to the new material. If the results are encouraging, the new organism is grown in greater and greater quantities, graduating from small laboratory flasks into larger equipment so that more of the new substance can be made available for study. The biochemist takes a hand in an attempt to determine chemical structure. The microbiologist treats artificially produced disease conditions in mice and rats. When purity of the new compound permits, the pharmacologist initiates long-term studies to demonstrate possible toxic effects when the antibiotic is given in extremely high dosage and over long periods of time. If the new compound can be produced in sufficient quantity and in high purity, if it has potential usefulness in treatment of disease, and if its toxicology indicates that it may be used with safety in the human, clinical investigation may begin.

The first cautious doses are given to patients with minor infections, perhaps a sore throat caused by an organism known to be susceptible to the new drug. Experience is broadened gradually, and with continued success treatment of more acute types of infection is attempted. These early clinical studies may best be done by the expert clinician on the research staff of the pharmaceutical manufacturer, and his results serve as the basis for extended study in medical institutions elsewhere. Thus, investigations, often supported by financial grants from the producer, may be carried on by capable investigators in many parts of the United States and often in foreign countries to determine just where the new antibiotic fits into medical practice. After months of clinical use, reports are assembled with other background data in a form suitable for consideration by the Food

and Drug Administration in Washington. Written material intended for the information of the practicing physician must be a part of this submission so that therapeutic claims and cautionary instructions can be checked and, if necessary, revised.

Approval by the Food and Drug Administration opens the way for introduction to the medical profession and ultimate use by the patient, but, at this point, the work of the clinical investigator has not yet been completed. Clinical research may be carried on for years after a new antibiotic is introduced to determine its effect against a variety of more obscure diseases, some of them peculiar to isolated areas of the world. Modifications of the parent compound having possible advantages in therapy may require studies almost as extensive as those done with the original material.

Traced in this sketchy fashion, it may appear that discovery of new anti-infectives is commonplace. To counteract this impression, remember the thousands and thousands of soil samples that have been collected from all over the world and the tremendous number of new organisms obtained from these soils, cultured and grown, only to be discarded as impractical antibiotic producers. While we have no more than ten or a dozen widely useful antibiotics in medical practice, several hundred of these compounds have been studied in detail only to find that they cannot be produced economically, that they are too toxic for human consumption, or that they do not have a useful clinical application. These are buried in the graveyard of scientific literature along with the high hopes of those who developed them.

This is the kind of research which has changed the outlook in treatment of many diseases from one of hopeless despair to one of confident assurance. More than half the drugs in use today were unknown twenty years ago, and many more new ones will be found as the years pass by. The time will come when such diseases as cancer and the mental disorders will be treated as successfully as the once-feared pneumococcal pneumonia.

. . . for a preparation for life, the educational processes which we have called cultural and those which we have called professional are really one in their objective. Any man given capacity and application can draw out of one, equally as out of the other, those elements of self-development which result in culture and refinement, in that self-development which, when it is attained, reveals to us the hidden significance of life, resolves the complexities of life into its simplicities and places before our vision now the sweetnesses and again the drama, now the unsuspected humor and again the even more unsuspected tragedy, now the sublimities and again the incredible pathos of every day human life in the midst of which "we live and move and have our being."

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 255 (1937)

VALUE OF FOUNDATIONS TO PHARMACEUTICAL EDUCATION

LLOYD E. BLAUCH

Among the significant features of our modern, wealthy, capitalist society are the ways through which private funds are applied to general welfare purposes. In a capitalist society wealth, to a very large extent, belongs to individuals. At the same time many public purposes must be served in a complex modern social order. This fact presents a never-ending problem: How can the funds required for public purposes be obtained and used?

We have adopted two general ways. First, we tax individuals and use the funds thus obtained to provide the needed public services through governmental agencies. Second, we encourage individuals to make donations to numerous charitable and philanthropic endeavors which in turn devote their energies and resources to public service. We have developed several means to help individuals to aid these charitable and philanthropic endeavors, one of which is the foundation.

THE MODERN FOUNDATION

A foundation, as the word is used here, is a nongovernmental, nonprofit organization having a principal fund of its own and established to maintain various activities that serve the common or public welfare. It is usually administered by an independent self-perpetuating board of trustees which appoints the officers, manages the fund, and administers the grants which it makes.

Although a few foundations in the United States were established in the nineteenth century, the great development of the foundation has occurred since 1900. Among the better known are those founded by Andrew Carnegie and the Rockefeller family. The foundation which largely set the pattern in the United States for later ones was the Peabody Education Fund, established in 1867. Among the later ones which have had extensive influence on education are the General Education Board (1902, no longer in existence), the Carnegie Foundation for the Advancement of Teaching (1905), the Russell Sage Foundation (1907), the Carnegie Corporation of New York (1911), the Rockefeller Foundation (1913), the Commonwealth Fund (1918), the W. K. Kellogg Foundation (1930), the Alfred P. Sloan Foundation (1934), and the Ford Foundation (1936). Probably the largest of these agencies is the Ford Foundation, which has assets amounting to upward of $990,107,132.

For some foundations the principal of the endowment is held in perpetuity, and only the earnings are used for the support of worthy purposes; for other foundations, however, both the principal and the earnings may be used. A few foundations have limited capital assets; they distribute their funds as the funds are collected. The latter type of foundation has been adopted in recent years to aid in the support of education in several health professions, particularly medical, dental, and pharmaceutical education. Any one who is interested in detailed knowledge of foundations in the United States would do well to consult a very useful book entitled *American Foundations and Their Fields*, Seventh Edition, by Wilmer Shields Rich (American Foundations Information Service, 860 Broadway, New York 3, N.Y., 784 p., $35.00).

Most of the foundations have had little if any concern for pharmaceutical education. A few, however, have provided some financial assistance. Thus the Gustavus and Louise Pfeiffer Research Foundation, established in 1942, has recently made a grant of $100,000 annually for five years to Columbia University in support of a new plan of pharmaceutical education. The H. A. B. Dunning Foundation, Inc., established in 1943, has made contributions for scholarships and fellowships and for a number of colleges of pharmacy.

In the rest of this paper I shall describe briefly the application of the foundation idea in pharmaceutical education.

AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION

The oldest and most widely known of the foundations in pharmacy is the American Foundation for Pharmaceutical Education, which was founded in 1942. For years many of the colleges of pharmacy had serious financial needs and marked deficiencies. This matter was of much concern to the drug industry, and for several years it was a subject of discussion by the National Drug Trade Conference, an organization representative of all phases of pharmacy. As a result the Foundation was established as a means by which the pharmaceutical profession and the drug industry could assist in providing well-trained personnel to man the retail pharmacies of the country and in furnishing such personnel for the industry and allied concerns, hospitals, governmental agencies, college faculties, and other professional fields.

When the Foundation was organized, an effort was made to establish a sizable permanent fund, the earnings of which would be used for Foundation purposes. This effort was successful only in part. The Foundation therefore began to spend its funds about as rapidly as donors supplied them. Today its permanent endowment is about $1½ million. The income from the endowment, together with the annual donations of manufacturers, wholesalers, and others in the drug and allied industries, provide approximately $250,000 a year to meet the budget of the Foundation.

The Foundation is governed by a board of thirty-five directors, five of whom are representatives of the colleges of pharmacy. The scholarship and fellowship awards which the Foundation provides are made by an autonomous Board of Grants.

The fifteen-year-old Foundation has rendered conspicuous service to pharmaceutical education. It has provided some financial war emergency aid to a limited number of colleges of pharmacy, supported 1,505 undergraduate scholarships and 396 graduate fellowships in pharmacy, provided the funds for student recruitment drives carried on by the American Association of Colleges of Pharmacy, assisted in the financing of the *American Journal of Pharmaceutical Education*, provided the funds for the Pharmaceutical Survey of 1946-49, and supported annual summer seminars for pharmaceutical faculties, and it has been the principal source of financial support of the American Council on Pharmaceutical Education (the accrediting agency in pharmaceutical education).

The Foundation maintains an office in Washington, D.C. It has a full-time Executive Director, now Dr. W. Paul Briggs, who was formerly a dean of a college of pharmacy.

OTHER FOUNDATIONS FOR PHARMACEUTICAL EDUCATION

I have found three other foundations, local in character and influence, which also serve the needs of pharmacy. One of these, the North Carolina Pharmaceutical Research Foundation, Inc., was established at the University of North Carolina in 1946, to foster and promote education and research in the School of Pharmacy and in the state. It solicits and receives gifts and donations and uses its funds to accomplish several purposes.

This foundation is managed by a board of twenty-four directors who serve without compensation. Sixteen of the directors are members of the North Carolina Pharmaceutical Association and are elected by that body; the eight others are elected by the remaining members.

Since the Foundation was established in 1946, the contributions to the endowment funds have reached a total of $122,737. The expendable contributions have been $66,922, and the interest earned from endowment has been $24,462.

During the same time the University of North Carolina has received from the Foundation the sum of $60,267, most of it for graduate fellowships. Some of this money has been used by the University's College of Pharmacy for supplies and equipment, library materials, research aid for professors, and undergraduate scholarships.

The Pharmaceutical Foundation of the University of Texas was established by the Board of Regents of the University in 1950 to render aid in maintaining a college of pharmacy. Pharmaceutical education, research, and graduate study were to be the beneficiaries of the Foundation. The Board of Regents of the University is the controlling board of the Foundation. A Board of Grants, consisting of the Dean of the College of Pharmacy, and all members of the faculty of the College of full professional rank, makes recommendations to the President of the University, for the allocation and expenditure of Foundation funds.

The foundation in Texas has a small endowment. It makes annual drives for contributions through which it receives about $6,000 a year. Its funds are used for scholarships in the College of Pharmacy, for graduate fellowships, for research, for supplementing salaries of teachers in the College of Pharmacy, for travel, for extension services, and for providing films used in recruiting students.

The most recently established of these foundations is the Mid-South Pharmaceutical Research Foundation formed in 1957 to promote pharmaceutical education and research in the School of Pharmacy of the University of Mississippi. It is managed by a self-perpetuating board of six trustees, each of whom serves for a three-year term. The Foundation appeals to the pharmacists of Mississippi for donations. It is a means whereby persons who so desire can help to improve pharmacy.

I suspect that some other public colleges of pharmacy may have established foundations. A number of private colleges also have foundations, which supply funds for operation, buildings, endowment, scholarships, and other purposes.

CONCLUSION

Such then in brief are the main facts on the foundation idea and its application to pharmaceutical education. The principle that lies back of the foundation idea is that those who profit directly from the education of pharmacists should assist in the support of pharmaceutical education. The foundation is a mechanism through which they can provide financial aid.

The foundations which have been organized in the field of pharmaceutical education are rendering a significant service, by way of supporting colleges of pharmacy, providing financial assistance to needy undergraduate and graduate students, promoting the improvement of teaching by pharmaceutical faculties, and encouraging the maintenance of high educational standards through the financial support of accrediting colleges of pharmacy.

In closing I want to suggest that pharmaceutical education in the United States is greatly in need of additional financial support. In particular, many more students of pharmacy should be encouraged to pursue advanced study and research through adequate financial support. The colleges are in dire need of well-educated teachers, and the industry is calling for increasing numbers of research workers. The pharmaceutical industry largely holds the key to this situation. Its donations will be a determining factor in the progress of graduate study in pharmaceutical fields.

The dean of a professional school is expected not only to provide an effective organization for a large group of people engaged in very complicated and highly individual tasks; not only to be a wise advisor and a just judge in issues of personal perplexity or of controversy — he is expected also to be the intellectual leader of a company of specialists, to focus their thinking on questions of institutional policy, to guide their combined efforts toward clear and definite ends.

Samuel P. Capen, Am. J. Pharm. Ed., 1, 501 (1937)

THE APPLICATION OF GROUP THINKING TECHNIQUES TO THE PROBLEMS OF PHARMACEUTICAL EDUCATION

LEE H. BRISTOL, JR.

Group ideation techniques have been used with increasing success in areas of industrial, government, and civic life. Such techniques have demonstrably helped groups to speed up the discovery of new and imaginative approaches to old as well as new problems. Educational and health organizations—hospitals, nursing groups, schools of pharmacy, etc.—are now discovering how these techniques can be used in their fields.

Whether you be a scientist in a laboratory trying to develop a new formula, an advertising executive trying to find new ways to interest the public in a product or service, a pharmacist trying to think up new ways to attract people to your store, or a teacher trying to discover new and better ways to teach, certainly it can be said that all of us are forever looking for new ideas and want to expose ourselves to techniques which can help us produce them.

There are a number of new group techniques for helping you come up with more ideas faster. Undoubtedly, you are familiar with a number of them. I was asked here today to speak about just one—a technique called "brainstorming"—because I happen to have had experience with the technique at Bristol-Myers and have seen first hand how successfully it can work. Frankly, I know of no method which can speed up the flow of ideas and enable a group to come up with so many ideas in as short a time as Alex Osborn's brainstorming.

Last March a creative teaching workshop was held at the University of Buffalo, New York, to consider "In what ways can American History be taught more creatively?" During the workshop the technique of brainstorming was explained and demonstrated. Then sixty teachers, divided into five separate groups, brainstormed the question of how American History could be taught more creatively. Actually, different groups considered different phases of the problem. One group, for example, considered how such teaching might be done more creatively "by use of sensory appeals, including audio-visual aids"; another considered how such teaching might be done more creatively "by use of role-playing, the case method, projects and other techniques entailing greater student involvement?" In just thirty minutes these sixty teachers produced well over 500 ideas. President Harvey M. Rice of the State University of New York College for Teachers wrote that "approximately 250 of the ideas are of usable quality, and many of the others can serve as helpful stimulants to any teacher who wants to teach more creatively."

BACKGROUND OF BRAINSTORMING AND RULES

Brainstorming was first developed in 1939 by Alex F. Osborn, co-founder of Batten, Barton, Durstine & Osborn. As the name suggests, brainstorming calls for the storming of an idea. You know how scientists speak of

"synergistic action," that is, the way two or more substances combined can produce something greater than the sum total of the parts independently? It is a sort of $2 + 2 = 5$ proposition.

Brainstorming can give you and your colleagues synergistic action, too, and save you time. As Alex Osborn points out, "Pilot studies give us a clear indication that you can often get fully 65 per cent more ideas from men thinking together in proper collaboration with others than when even the same number of people are thinking about the same problem by themselves for the same period of time."

Here are four Osborn rules for brainstorming. Your success at brainstorming will largely depend on how strictly you adhere to them:

1. Criticism is ruled out: All criticism must be withheld until later. This rule, even more than the others, is the key to the whole technique. Mr. Osborn maintains that most of us fail to come up with half the ideas we could oftentimes, largely because we permit ourselves to be critical at the same time we are trying to be creative. It is, he says, a little like trying to get hot and cold water from one faucet simultaneously. The ideas are not hot enough. The criticism is not cold enough. Results are tepid. To make certain that your panel members do not break this no-criticism rule, many chairmen make a point of using a schoolmaster's bell which they ring any time a panel member criticizes an idea or apologizes for a suggestion he makes. There will be criticism, but it must be withheld until a later session.

2. The wilder the ideas the better: "But is this not a waste of time?" you may ask. It is not a waste of time to come up with a seemingly impractical idea if it succeeds in suggesting to another panel member a practical idea which might not otherwise have occurred to him.

3. Quantity is desired: The greater the number of ideas, the more likelihood of good ideas. As well you know, it is far easier to shorten a long list of suggestions than to make a short one look longer and more impressive!

4. Combination embellishment and improvement are sought. In addition to contributing ideas of their own, panel members will want to suggest how the ideas of others may be combined or improved. This sort of "cross-pollenization" can be a valuable feature of your brainstorm session.

HOW TO START BRAINSTORMING

First of all, to start brainstorming you need to appoint a panel chairman. You will want to choose him with great care, because your chairman can mean the success or failure of your brainstorm session. You want to choose a keen-witted, friendly person who is able to be both a "driver" and a "relaxer," that is, someone who can keep the session atmosphere friendly and informal.

Next, you will want to appoint a secretary who will assist in making the arrangements for the session. It is often helpful to bear in mind the nature of the problem when you choose your secretary. If your problem is a highly specialized one, it will be helpful to have a secretary who is familiar with some of the terms which will be used. All the secretary needs to do, however, is to take down the gist of each idea, not the exact wording. In no case should the chairman be the one to take notes.

In choosing your panel members, it is wise to choose at least one or two people of known creative ability. You may find it wise, also, to choose a few panel members who are not too close to your problem, because their ideas may reflect a more refreshing approach to your problem.

CHOOSING YOUR BRAINSTORM TOPIC

In choosing the problem to be brainstormed, you will want to make certain that you do not choose one which is overly general.

The Weather Bureau here in Washington recently scheduled a brainstorm session on the subject: "How can we improve the hurricane warning system?" Because it was too general a topic, the Chairman Albert V. Carlin wisely broke the problem down into questions and had his panel consider each separately for twenty minutes: "(1) How can we make sure that everyone in the hurricane belt receives the warning?; (2) How can we make certain that everyone in the hurricane belt who receives the warning understands it?; (3) How can we make sure that everyone who receives the warning and understands it knows what to do about it?"

Because criticism and judgment are ruled out, brainstorming cannot be used as a checklist or for value judgments like: "When should we introduce such-and-such a new course?" or "Which proposal will return the largest value to our school for the dollar spent?" But brainstorming could very well help you come up with ideas for running tests which perhaps might answer such questions.

If your panel members have not brainstormed before, you will do well perhaps to hold a practice session first on some unrelated problem. At West Point, New York, not long ago, a panel of public health nurses practiced by considering the question: "If you were asked to organize the perfect club for career women, what would you like such a club to include?" Like a clap of April thunder, the girls roared, "Men!"

MISTAKES TO AVOID

To start brainstorming in your group, you will do well to avoid these mistakes:

1. Failing to get support for your brainstorming program of at least one of your superiors.
2. Boasting prematurely about brainstorming and getting your colleagues to expect too much.
3. Failing to indoctrinate your panel adequately.
4. Submitting the unscreened list of ideas to people unfamiliar with how brainstorming works. It is best to keep the unscreened list confidential.
5. Failing to see that the next steps are taken.

But what are those next steps? After your brainstorm session, you will want to have your secretary call your panel members twenty-four hours after the first session to see if they have had any more ideas. Then you will wish to make up copies of the complete unscreened list for your screening group to go over in detail at the second, or critical, session. You will then wish to submit your screened list and arrange a later planning session at which the best ideas are put in motion and acted upon.

One brainstorm panel, for example, produced sixty-one ideas on how to increase long distance telephone calls. Those sixty-one ideas were then screened at a second session. The resulting list of forty-one suggestions then went to the operating committee. Sixteen of these ideas have since been used.

You may have seen the recent flood of articles on brainstorming which have appeared in magazines. You may have read how the technique is being used by the armed forces, the federal government, colleges and universities, civic and religious groups, as well as business firms of all kinds. As a matter of fact, of the ten largest United States firms listed by *Fortune* magazine in a recent survey, nine use brainstorming in some phase of their operation.

There are innumerable ways brainstorming can be used. Whether it be curriculum revision, fund-raising projects, how to attract more students to a particular program or your particular school, or how to improve community relations which currently concern your group, no doubt brainstorming can help produce ideas you can use. One professional group in New York City uses brainstorming as a technique for helping new members to become acquainted. One food store chain uses brainstorming to get younger executives accustomed to expressing their ideas. Better morale, improved communications between different groups in your organization—these can be valuable by-products of your brainstorming program.

Sure, brainstorming has its shortcomings. Even its originator Alex Osborn never claimed that it was a miracle drug for every need. But it can help you save time in meeting any number of different problems. Actually, we have not been using the technique of brainstorming, unless we have faithfully followed the rules and suspended criticism at the first session.

An Englishman I know says, "We must be open-minded enough to realize that a thing may be true, even if we have not heard of it before, and indeed may be true if we definitely disagree with it. We must seek for the truth and not for the confirmation of our preconceived ideas."

In another article you are going to read a detailed report of how brainstorming was used effectively by dynamic leaders at the Columbia University School of Pharmacy. I only hope from what I have said of the technique and from what you learn from the Columbia case history, that you will be determined at least to give the technique a fair try. If you do, I warn you. You will be in danger—in danger of becoming known as an "idea man," and they are much in demand these days.

We have not probed even the shallowest depths of the educational processes in the formation of the professional man.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 253 (1937)

THE BOBST-COLUMBIA PLAN FOR PHARMACEUTICAL EDUCATION, THE FIRST APPLICATION OF GROUP IDEATION TO CURRICULUM DEVELOPMENT

LEO ROON AND E. E. LEUALLEN

This is the story of a project in education, more specifically a project in curriculum development, in which over 100 persons participated and which led to the development of the Bobst-Columbia Plan for Pharmaceutical Education.

In the pharmaceutical profession we have that part which is known as "industry" which has developed through intense and costly research an ever-expanding number of miraculous therapeutic agents and medicinals. Industrial pharmaceutical research and production have made an astounding record of progress, resulting in better health and a longer and more enjoyable life for our people.

Teamwork among specialists—the chemist, the biochemist, the pharmacologist, the pharmacist, and others—has been the key to success in industrial pharmacy.

The second major part of the pharmaceutical profession is that commonly referred to as "retail pharmacy." In a single nation this segment of pharmacy frequently embraces a great variety of "stores" and types of operations ranging from the purely professional to the most blatantly commercial, and out of this caldron have come a number of disturbing problems.

1. The pharmacist is deeply concerned with the encroachment of new forces of distribution and the evolvement of great changes in merchandising practices.

2. He sees the great advances in therapeutics going on around him, and he wonders how he can be of greater service to the physician.

3. He earnestly desires recognition of his professional status, although he frequently practices in a largely unprofessional environment.

From the educational viewpoint it is interesting to note that a large percentage of the colleges of pharmacy train students for the retail field almost exclusively. In the United States approximately 80 per cent of the graduates enter this field, although very recently a much lower figure has been reported for certain schools.

It was with full knowledge of these conditions and problems that the Columbia University College of Pharmacy began to modernize its curriculum coincident with planning for a new school in a new location adjacent to the main campus of the University. Fortunately, it sought the advice of Mr. Elmer Bobst, head of a great pharmaceutical company and long known for his clear thinking and uncanny vision.

Under the inspiring leadership of Mr. Bobst, the College of Pharmacy was encouraged and stimulated to take a new look into the future functions of the pharmacist and to find out what would be required to prepare our students of tomorrow for these functions.

These are the steps we took:

Step 1. Ideation

In what we believe to be the first application of the technique to curriculum development, we used "brainstorming," as described by Mr. Bristol in the paper which precedes this one, to ask for ideas about the functions of the pharmacist of the future.

The six groups of people, or panels, who took part in this phase were:

(1) Retail pharmacists from all parts of the United States
(2) Retail pharmacists from the local metropolitan area
(3) Physicians
(4) Consumers
(5) Pharmaceutical journalists and association secretaries
(6) Pharmaceutical manufacturers

From the panels we received 350 "ideas" which were then classified and submitted to an Evaluation Committee.

Step 2. Evaluation

The Evaluation Committee under the chairmanship of Dr. Robert L. Swain, one of pharmacy's great statesmen, appraised the ideas and summarized them in the form of an outline for the guidance of the Curriculum Committee. The ideas fell into four groups relating to:

(1) Allied fields for pharmacists
(2) Professional, community, and public relations
(3) Location, environment, and operation
(4) Education

Each of these groups could be broken down into several subheadings, thus, Group 1, Allied fields for pharmacists, contained ideas relating to:

(a) Special departments in the pharmacy
(b) Surgical and medical equipment
(c) Laboratories and testing
(d) Detailing
(e) Hospital pharmacy
(f) Industry
(g) Additional functions

Step 3. Curriculum Development

The Curriculum Committee faced the monumental task of determining what courses and what instructional techniques were necessary to accomplish the goals set forth in the previous steps. Under the direction of Dr. Rudolf O. Hauck, a graduate of and former teacher in the College, now an executive in industry, the Committee prepared recommendations for eight separate curriculums, seven of which are designed to meet the needs of pharmacy—

in professional practice
in medical detailing
in pharmaceutical research
in pharmaceutical production
in pharmaceutical control
in hospital pharmacy, and
in pharmacy — medical technology

In addition, a curriculum in medical technology was proposed to prepare candidates for hospital and clinical laboratory needs.

The Curriculum Committee tried to be bold in facing the future educational needs of pharmacy. It did not hesitate to break with tradition where necessary.

On January 27, 1957, the project was brought to completion and presented to a conference attended by 600 leaders in education, pharmacy, and medicine. Now, almost a year later, with time for calm reappraisal and with the benefit of the critical comment of many individuals, we are convinced more than ever that a desirable, if not necessary, pattern has been set. This is the program, the Bobst-Columbia Plan for Pharmaceutical Education, that Columbia will offer beginning in 1960. The curriculum provides for uniform minimum training in academic subjects, in basic sciences, and in professional courses, supplemented by specialized preparation for the career area of the student's choice. The pharmacist, trained under this plan, will be prepared for greater service to the community, to industry, to the physician, to public health, and to the profession of pharmacy.

THE BOBST-COLUMBIA PLAN

Basic Requirements

I. Academic

English Composition
Communication Skill
Contemporary Civilization
Humanities
Social Science and Ethics
Mathematics (through Analytic Geometry)

II. Basic Sciences

Inorganic Chemistry and Qualitative Analysis
Quantitative Analysis
Organic Chemistry
Biochemistry
General Physics
Biology
Physiology
Microbiology

III. Professional

Contemporary Pharmacy
Pharmaceutical Calculations
General Pharmacy
Physical Pharmacy
Dispensing Pharmacy (I and II)
Pharmacy and Chemistry of Medicinals
Pharmaceutical Analysis
Pharmacognosy
Pharmacology
Accounting and Business Law
Jurisprudence
Public Health

Other Courses Required Under This Plan

	Practicing Phar.	*Medical Detailing*	*Phar. Research*	*Phar. Production*	*Phar. Control*	*Hospital Phar.**	*Phar.-Med. Technology**
Pharmacy Management	X	X					
Salesmanship	X	X					
Advertising	X	X					
Departmental Merchandising	X						
Sterile Products Manufacturing				X		X	
Cosmetic and Dermatologic Formulation				X		X	
Manufacturing Pharmacy	X						
Detailing	X	X					
Dispensing Pharmacy III	X						
Hospital Pharmacy		X				X	
Products Development			X			X	
Calculus			X				
Physical Chemistry			X				
Advanced Pharmaceutical Analysis					X		
Advanced Microbiology							X
Advanced Pharmacology (Modes of Drug Action)		X	X			X	
Industrial Pharmaceutical Manufacturing				X			
Pharmaceutical Control Methods			X		X		
Production Control				X	X		
Microbiological Control Methods					X		
Microscopical Control Methods					X		
Medical Terminology	X	X				X	
Blood and Urine Chemistry							X
Parasitology							X
Histology and Tissue Technique							X
Elementary Mycology							X
Advanced Mycology							X
Elementary Blood Technique							X
Advanced Blood Microscopy							X

*Internship provided

When there is plenty of anything, it seems always to be purchasable at a lower price, and so perhaps we have come to lay less stress upon the value of education.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 248 (1937)

CHANGES INFLUENCING THE TEACHING OF PHARMACY IN THE UNITED STATES

TOM D. ROWE

In 1932, the four year program leading to the Bachelor of Science degree became compulsory for all member colleges of the American Association of Colleges of Pharmacy. Inasmuch as nearly all colleges of pharmacy in the United States held, and hold now, membership in this organization, this requirement meant that the four year program was in operation in all but a few of our institutions. We have, therefore, just concluded twenty-five years requiring four years for a pharmacy degree. During this time, we have witnessed many changes and improvements in our colleges. It is some of the changes that have occurred during this twenty-five year period that I wish to talk about today.

FACILITIES

Relatively few of our colleges of pharmacy were adequately housed in 1932. Many of them were operating in cramped quarters, with laboratories poorly lighted, poorly ventilated, and poorly equipped. In some cases the quarters were quite inadequate for the number of students enrolled. Fortunately, during this twenty-five year period, the facilities of practically every college have been greatly improved. At least forty of the present seventy-four member colleges are now housed in new buildings erected specifically for pharmacy, or are in new buildings or wings which have adequate space allocated to pharmacy. Extensive remodeling and expansion have occurred in practically all of the others. Along with the new and additional space, much new equipment has been purchased. The result today is that our colleges of pharmacy have housing and equipment fairly adequate for a creditable job of teaching. Most of the colleges have sufficient space to permit an increase in undergraduate enrollment. While it cannot be measured in specific terms, this improvement of facilities and equipment has obviously made it possible for the courses taught to be better in quality.

STUDENTS

There are no satisfactory data available to show that the students entering pharmacy today are better qualified than they were twenty-five years ago. Furthermore, the minimum admission requirements in a majority of the colleges are the same today as they were then: graduation from a four year accredited high school. Nevertheless, there is no question that we have more well-qualified students now than ever before. This statement can be partly verified by some situations that exist. For example, in a few of our colleges, pharmacy students take the same courses in pharmacology as do the medical students. In such cases the pharmacology professors are frequently high in their praise of pharmacy students. They state that they usually hold their own with the medical students. This group, as we all know, is a highly selected class of students. In many of our colleges, especially those associated with universities, pharmacy students take most

of their nonprofessional courses with other students on the campus—premedical, engineers, and others. Generally, the pharmacy students are equal in standing to any of these groups.

Having taught for twenty-three of these twenty-five years, I know from personal experience we have more good students today and fewer poor ones than we did when I started teaching. I believe almost all teachers who have been active during this period would agree with this.

If we can assume then that the quality of our students has improved during the past twenty-five years, we should expect our teaching to have been raised to a higher level and to be of better quality. I'm sure this is true.

FACULTY

In discussing facilities and quality of students, I have assumed that because of improvement in these two factors, the quality of teaching has improved. I believe this assumption is true, but actually we all know that good facilities and good students do not necessarily mean good teaching. We have certainly created the climate for good teaching. The question, then, is whether or not we are actually getting it.

I am certain that our teaching has improved tremendously during this twenty-five year period. While we have no reliable means of measuring the improvement, I think this area has shown the greatest change of any. I think this to be true because of the caliber of our faculty members today and the large numbers of them who have taken graduate work.

Again, we have no figures available on number of faculty members who had M.S. or Ph.D. degrees in 1932. We do know there were many colleges without any Ph.D.'s on their staffs, and some with practically no faculty members having the M.S. or M.A. degree. Many had not even earned the Bachelor of Science. In fact, it was quite common for faculty members to have only the Ph.G. or Ph.C. degree.

Today the picture is completely changed. *The Roster of Teaching Personnel in Member Colleges, American Association of Colleges of Pharmacy, 1955-1956,* showed there were 634 full-time teachers in the five areas of professional instruction: pharmacy, pharmaceutical chemistry, pharmacology, pharmacognosy, and pharmacy administration. Of these, 579 or 91.3 per cent had earned either a master's or doctor's degree. A further breakdown showed 380, 60 per cent of the total teaching staff, held the Ph.D., and 199, 31 per cent, held the M.S. or the M.A. Only the highest earned degree was used to obtain these figures so there is no duplication of degrees held. I would guess that in 1932 less than 20 per cent of our faculty members had any degree beyond the bachelor's. Certainly the number with Ph.D. degrees was small—probably less than 10 per cent of the total national faculty in pharmacy.

We have today, then, many times as many faculty members who have done graduate work as we had twenty-five years ago. Certainly our teachers are better qualified because of graduate study. While a Ph.D. degree will not automatically make a man a good teacher, he certainly has a better grasp and understanding of his subject material because of his additional course work and research.

For many years our teaching was largely empirical. Our teachers did not know or understand the basic principles of much of the material presented. This situation existed partly because the information was not available in the literature, and partly because the teachers did not have the background to understand what information was available. As a result, we had a great deal of "cook-book" type of teaching. While we still have some of this, it has decreased significantly. Now most of our courses are taught in logical and scientific manner.

The graduate education that our teachers have had has made possible revision of all courses and addition of new ones. Modern courses in physical pharmacy and in pharmaceutical technology could not have been given twenty-five years ago. Only because our faculty members have done graduate study and research is it possible to teach them now. Dispensing, so often referred to as the capstone of the pharmacy curriculum, can no longer be taught properly on the basis of weighing, mixing, and pouring. Understanding of principles and applications of theory, all brought about by graduate study, now make this course a dynamic problem solving subject.

For the past three years I have been privileged to serve as a member of the American Council on Pharmaceutical Education. This has given me opportunity to visit a number of our colleges of pharmacy and sit in on many classes. While I have met some poor teaching, I have seen much more that is good. The teachers get to the heart of most problems, and, furthermore, they know and understand what they are talking about. Again, this is possible because of their having learned much more through graduate study than is encompassed by the text being used by the students.

Having done research as graduate students, most of the faculty members continue their efforts in investigation. While their problems may not be directly concerned with the courses taught, continued research stimulates their thinking and provides them with new and more accurate material to include in their course work.

A final point I wish to make concerning the effect of graduate study has to do with the five year program. While we probably could have offered an extended program with the old-fashioned, poorly trained faculty, the extension would not have accomplished a great deal. Actually, it would probably have meant that the equivalent of a year's electives in nonprofessional courses would have been added, and the professional courses would have been very much as they always were. As it is, however, the already improved courses will be made even better. Having had better background in the prepharmacy period, the students will be in a position to profit from pharmacy courses taught on a higher level. Only faculty members who have an excellent grasp of their field because of graduate study will be able to teach properly these higher level subjects. Because of the improved courses, the students will complete their undergraduate program much better qualified than had the subjects been taught by less well-trained teachers.

The conclusion is inescapable: graduate study by large numbers of faculty members has had a pronounced beneficial effect on the teaching in our colleges of pharmacy. The increased interest in graduate education has probably had a greater influence on their teaching than any other single factor. Because of this effect, practically all colleges today require the Ph.D. degree for new faculty appointments. I am confident this situation

will continue as long as well-trained teachers are available. Assuming we continue to get teachers with adequate graduate training, we can be certain the quality of teaching will continue to improve in the years to come.

Lack of time prohibits any lengthy discussion of why we now have better-trained faculty members. Two points should, however, be mentioned briefly. First, we have more colleges offering graduate programs of quality. Consequently, graduate study is more generally available, and more students are attracted by it. Second, the American Foundation for Pharmaceutical Education, by means of its fellowships, has made it financially possible for many young men to enter graduate school. A high percentage of these have selected teaching careers upon completion of their studies. The American Association of Colleges of Pharmacy is keenly aware of the Foundation's efforts to help improve pharmaceutical education. We extend our sincere thanks to the Foundation for its assistance.

SUMMARY

Three major factors influencing the teaching in our colleges of pharmacy have been discussed. While the first two—better facilities and better-qualified students—have had a beneficial effect in making our teaching better, the most important factor has been the increased number of faculty members who have undertaken graduate study. Because our better-trained faculty members have a better understanding and grasp of their subjects, we have been able to minimize the "cook-book" style of teaching. Today we are not dealing as much with memorization of facts as we are with reasoning and understanding. This change is important because it takes our students away from the robot approach to professional problems and enables them to work out the solutions more logically. The result is a better pharmacist —made so because of better-qualified teachers.

The future of the profession of pharmacy is brighter today than it has ever been before with so many young men going into the profession, not only with the best scientific and technical training, but also with that liberal education which will enable them to appreciate the social obligations which rest upon them and the opportunities for service which are theirs, we may expect some desirable things to happen.

Harmon W. Caldwell, Am. J. Pharm. Ed., 1, 34 (1937)

PHARMACEUTICAL EDUCATION IN THE UNITED STATES

H. G. HEWITT

In order that we may all better understand the progress of pharmaceutical education in the United States, I should like to touch briefly on some of the major developments in the evolution of our professional program. I am indebted to Drs. Edward Kremers and George Urdang, whose *History of Pharmacy* gives us a comprehensive picture, as well as *Education for the Professions* by Lloyd E. Blauch, and *The Pharmaceutical Curriculum* by Lloyd E. Blauch and George L. Webster.

In earliest colonial times, the few practitioners of our art followed the tradition of European pharmacy. This phase might be referred to as the *adoptive period* in contrast to the later *adaptive,* and later still the *creative stages* of the evolution of our professional training.

Among our earliest apothecaries, who came from Europe, were the physicians who prescribed and compounded. General stores in pioneer settlements dealt in drugs as well as in everything else.

One of the great changes to come about in these early days was the *adoption* of a system in which the retailer and wholesaler assumed unique positions in our profession. The knowledge of pharmacy in Europe was born and flourished in the retail pharmacies. It was there that pharmaceutical manufacturing took place and where the groundwork was *laid for both wholesale* distribution and large-scale manufacturing.

The development of pharmacy in the United States followed a different course. The wholesale drug merchant was faced not only with high cost on imported drugs, but absence of any standard of quality and more frequently adulteration and spoilage; hence he made a determined effort to free himself from foreign sources. Thus the wholesaler and the manufacturer took an important step which was to produce the true professional pharmacist. Apprenticeship, such as it was, began under these conditions.

EARLY PHARMACEUTICAL EDUCATION

Pharmaceutical education in the United States up to the seventeenth century limited itself solely to experience gained through apprenticeship. With the arrival of increased numbers of European apothecaries in the early part of the eighteenth century, preceptorship served as the only method of training for pharmacy as a specialized activity.

Early educational activities were initiated by associations of pharmacists. They called their training centers "colleges." This was the beginning of the *adaptive period.* The first of these pharmacist association schools was the Philadelphia College of Pharmacy, founded in 1821. The motive which brought about the founding of this and other early institutions was the need for protecting the public against inferior drug products. This early training taught methods of detecting adulteration and substitution in marketed drug products. The men who established these early schools were men of integrity with a full realization of their professional responsibility to society.

The establishment of this association of pharmacists school in Philadelphia set the pattern for other groups of pharmacists in other cities to do the same.

Boston, New York City, Baltimore, Cincinnati, Chicago, and St. Louis established schools. These early attempts at professional education met with varying degrees of success — in the over-all, they were not too successful. Such optional training programs operated by such associations produced approximately 500 students up to 1860.

PRIVATE PHARMACY SCHOOLS

The era of these so-called "schools" established by associations ended about the middle of the nineteenth century. Schools associated with established institutions of learning or as private entities began to appear. True elements of a systematic scientific training were slow in coming. The sole function of these early schools was to supplement the practical knowledge of the apprentice.

The source of support in the majority of these schools worked against any true progressive development of pharmaceutical education. They depended entirely upon the generosity of the interested pharmacists and the income from fees. This kept the nature of training much as it had been — an inadequate program of augmented apprenticeship. This period was one of apprenticeship training augmented by these glorified "trade schools."

AMERICAN PHARMACEUTICAL ASSOCIATION

All pharmacists are indebted to the American Pharmaceutical Association for extraordinary leadership in its farsighted wisdom in developing the many facets of pharmacy. Not the least of these was the recognition of the need to regulate the system of apprenticeship to prevent the evils which came from deficient training in the responsibility of preparing and dispensing medicine.

In 1870, the Association recognized the necessity for higher standards in pharmaceutical education, both in theory and practice.

STATE UNIVERSITY SCHOOLS OF PHARMACY

At the St. Louis meeting of the American Pharmaceutical Association in 1871, Dr. A. B. Prescott explained the advantages of the program established at the University of Michigan in 1868. Here was a full-day instructional program, including laboratory work, in a course of four terms of three months each and requiring no store apprenticeship. This was indeed revolutionary and was overwhelmingly rejected. This was a sad day for pharmacy, for here we had a public disavowal of the principle of formal education by organized pharmacy.

Fortunately, many leading pharmacists had an appreciation of the value of a broad scientific education. They gave increased encouragement and impetus to this type of program which began to be offered by other state universities.

It is proper here that we pay tribute to the name of one of the foremost American pharmaceutical educators, the late Dr. Edward Kremers of the University of Wisconsin. He started a voluntary four year course in pharmacy in 1892.

The struggle between practitioner and pedagogue has not been absent in the development of pharmaceutical education in the United States. The advances in programs from less than one year of training through the three, four, and now five year program have met with continual and repetitive arguments from many of our practitioners.

In all fairness let us state that we have had many dedicated nonprofessional educators and many within our own ranks who have opposed each step in these advances.

EDUCATIONAL ORGANIZATIONS

The only agency interested in education other than the American Pharmaceutical Association in the nineteenth century was the Conference of Schools of Pharmacy. This group existed between 1870 and 1884, and had as its objective the elevation of pharmaceutical educational standards.

As an outgrowth of the activities of the American Pharmaceutical Association, there was founded in 1900 another association of schools of pharmacy known as the American Conference of Pharmaceutical Faculties. This continued until the name was changed in 1925 to the American Association of Colleges of Pharmacy. It is pleasing to note that the first president of the American Conference of Pharmaceutical Faculties was Professor A. B. Prescott, who had been so thoroughly rebuked at the American Pharmaceutical Association meeting in St. Louis in 1871.

ADMISSION REQUIREMENTS

Sweeping advances in educational standards in our programs have taken place since the turn of the century. The role played by the American Conference of Pharmaceutical Faculties and its successor, the American Association of Colleges of Pharmacy, has been most effective.

The First Year Class. Prior to the early 1900's, the only qualification needed to pursue training in pharmacy in most schools was a desire to become a pharmacist, sufficient energy to meet the modest training demands, and the money necessary to meet the tuition and fees. Prior to action of the Conference, the majority of the schools accepted students having only a grammar school education. In 1908 satisfactory completion of at least one year of work in an accredited high school or its equivalent was required for admission. Two years of high school work or its educational equivalent were required for the year 1917-1918. Graduation from high school was required by Conference schools in September of 1923.

There is now an added requirement that the applicant must obtain a satisfactory score on an entrance examination. This test may be that developed by the individual school or the Scholastic Aptitude Test or the College Entrance Examination Board. This latter examination is becoming more widely used by pharmacy schools in line with entrance examinations required by other divisions of our universities. A move is now under way by the American Association of Colleges of Pharmacy to study the need for and the best way to obtain adequate information through predictive tests to aid schools in selecting students for admission to the study of pharmacy. It is hoped that some Foundation may be interested in this important study.

The Length of Program. Prior to 1907, the American Conference of Pharmaceutical Faculties members were required to offer instruction of not less than forty weeks. In 1907 the work required was "to be given in a period of not less than 50 weeks, occupying two full years, and that at least two months shall elapse between these two years."

The Conference adopted the three year course of study as a minimum to become effective in 1925. The American Conference of Pharmaceutical Faculties' successor, the American Association of Colleges of Pharmacy, adopted the four year program to become effective in July of 1932.

From the studies of the various committees of the American Association of Colleges of Pharmacy and the discussions at the American Association of Colleges of Pharmacy conventions, the need of a five or a six year program has received attention since 1936.

The proposal of the American Association of Colleges of Pharmacy Committee on Curriculum relating to the six year program came as a result of its study as to the possibility of achieving the accepted objectives of professional education in pharmacy in a four year period. It was the committee's considered opinion that this time was not adequate. Its recommendation, in brief, was for the college adoption of a two-four plan beginning in the fall of 1956. This six year program was rejected as compulsory by the American Association of Colleges of Pharmacy in a meeting in Jacksonville, Florida in 1949.

The matter of a five year program for training was then submitted for the Association's consideration. It was adopted at the Boston meeting in 1954 to become effective in 1960. The last class to be admitted under our four year program is the group entering in September of 1959 and graduating in 1963.

The Professional Program. Some schools now require a year of pre-pharmacy work in an accredited college or university before gaining admission to the professional training program in pharmacy. This type of preprofessional training will grow, of course, as our programs are extended beyond a four year period of training.

In 1948, the University of Puerto Rico required one year of liberal arts education before the four year curriculum in pharmacy. This one-four plan is one of a variety of distributions appearing as schools develop their five year training programs. When, in the same year, Ohio State University put into operation its compulsory five year program, it admitted students to its professional curriculum only after two years of college credit. The University of Montana offered an optional two-three program for three years before this program became compulsory in 1950. The other program being considered involves no preprofessional training, but rather an integrated program of five years' duration. This is known as the zero-five program. When one reviews the plans now in operation of those contemplated, by far the greatest number seem to prefer the two-three pattern. As of this fall, there are fourteen schools operating on a five year program and two on the six year program.

PHARMACY DEGREES

Lacking the significance of baccalaureate degrees accepted by educational institutions, much confusion existed as to which degrees should represent the two, three, and even the four year courses in the first part of this century. A survey recorded in 1918 by the American Conference on Pharmaceutical Faculties gave the Pharmacy Graduate degree (Ph.G.) for completion of the two year program. With the added year of training, most member schools offered the Pharmaceutical Chemist degree (Ph.C.); the Bachelor of Science in Pharmacy degree (B.S. in Phar.) was offered upon completion of four years of training.

With the requirement of a four year training in an accredited institution leading to eligibility for examination for licensure, some schools wanted to offer the Doctor of Pharmacy (Phar.D.) degree. Since this degree has been conferred as an honorary degree or granted on the completion of programs varying from three to seven years of training, it has little meaning and has fallen into disrepute.

In 1948 the American Association of Colleges of Pharmacy approved the granting of the degree of Doctor of Pharmacy (Phar.D.) on the completion of a six year program of education and training, the program to include two years of general education and basic science training and four years of professional education in an accredited college of pharmacy.

With the adoption of the five year program in pharmacy effective in September of 1960, the whole matter of the degree to be granted was reopened. Again, lack of agreement required action by the American Association of Colleges of Pharmacy. In the meeting at New York, held during April of 1957, it was decided that only a baccalaureate degree or baccalaureate degrees may be awarded for the five year curriculum. "The preferred degree is either Bachelor of Science in Pharmacy (B.S. in Phar.) or Bachelor of Pharmacy (B.Phar.). If the candidate for a degree in pharmacy meets the institutional requirements for either the Bachelor of Science (B.S. or S.B.) or Bachelor of Arts (B.A. or A.B.) degree prior to the time of completion of the prescribed curriculum in pharmacy, nothing in this statement shall be interpreted as being critical of or opposed to the granting of such a degree in lieu of or in addition to one of the preferred degrees."

ACCREDITATION AS AN AID IN OUR PROFESSIONAL PROGRAM

For many years, the accreditation of the programs in our schools and colleges of pharmacy remained the province of the American Association of Colleges of Pharmacy. There were many disadvantages to this system. In general, those who do the teaching should not be the examiners if the best interest of all concerned is to be served. The best programs of training in professional education have come about by the setting and the enforcement of standards by properly constituted accrediting agencies. Pharmacy is no exception.

In 1904, New York State enacted a law compelling every applicant for pharmaceutical licensure in that state to have previously graduated from a recognized college of pharmacy. It immediately became evident that some responsible body must outline a syllabus for the boards and colleges.

After much preliminary discussion, it was decided this should be done by a committee of three representing the Department of Education of New York State, the New York Board of Pharmacy, and the Council of Deans of New York Schools of Pharmacy. Realizing the need for this syllabus on a national scale, the committee was reorganized in 1906 to include one representative each from the National Association of Boards of Pharmacy and the American Conference of Pharmaceutical Faculties.

AMERICAN COUNCIL ON PHARMACEUTICAL EDUCATION

While there may be variations in the success of the many accrediting agencies which visit colleges and universities one in particular has, and does, enjoy well-deserved success. I refer, of course, to the American Council on Pharmaceutical Education. It was organized in 1932 to serve as an accrediting agency for our colleges and schools of pharmacy. It is composed of three members each from the American Association of Colleges of Pharmacy, the American Pharmaceutical Association, and the National Association of Boards of Pharmacy, along with one representative from the American Council on Education.

The first accreditation standards were adopted in 1937, and have been revised four times up to 1952. There is a fifth revision under way to accommodate needed changes including those involving the five year program.

The efforts of this Council have indirectly and directly been responsible for the improvement in the quality of our staffs, as well as for the elevation of educational and professional standards in our schools of pharmacy. The members of the American Council on Pharmaceutical Education have created good feelings and a greater respect for pharmacy by their association and cooperation with members of the other national accrediting agencies.

In 1937 the American Council on Pharmaceutical Education required the colleges of pharmacy to use the Pharmaceutical Syllabus as a guide in developing their programs. A rising tide of objection resulted from the required use of this syllabus as a basis for accreditation. It was thought that the material in such a syllabus could not keep abreast of the changes occurring in our professional programs. There was further objection by many institutions to this "strait jacket" which would prevent them from carrying on educational experiments. The Executive Committee of the American Association of Colleges of Pharmacy voiced this criticism to the American Council on Pharmaceutical Education.

This Council in 1946 decided to drop the syllabus as a requirement for its accreditation standards. During the same year, the American Association of Colleges of Pharmacy established a standing committee on curriculum, which was to outline a four year program for the benefit of member schools. This Curriculum Committee has been active ever since, and has offered programs of four, five, and six years for our schools of pharmacy.

The Council's list of accredited colleges, published July 1, 1957, includes seventy-one Class A schools, one Class B school, and one Class C school. Further accreditation includes two Class Y-2 listings which represent schools whose programs have been operating less than four years, and one unclassified school.

THE AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION

During the latter part of the 1930's, the National Drug Trade Conference undertook a study to develop the best and most practical means by which pharmacy could be advanced and strengthened through support to pharmaceutical education. This Conference represents all phases of pharmacy, and the results of its study brought about the formation of the American Foundation for Pharmaceutical Education in 1942.

The Foundation's principal objectives were: (1) to encourage and assist in providing improved educational standards and facilities for the adequate training of competent personnel in the practice of pharmacy and all related fields; (2) to supply the pharmaceutical and allied manufacturing industries, hospitals, government agencies, college faculties, and other professional fields with technically and scientifically trained personnel; (3) to help colleges develop strong undergraduate programs; (4) to support graduate work in properly qualified colleges; (5) to encourage scientific research as a necessary component of graduate work and as special projects.

"This Foundation has been supported since 1942 by leading companies of the manufacturing drug, pharmaceutical, proprietary, chemical, surgical dressing, prescription accessory, container and related industries; the wholesale drug trade; chain and independent drug stores; the pharmaceutical press; and the producers of commodities usually supplied to the 53,000 pharmacies in the United States."

These patrons of the Foundation, through contributions totaling over $2,700,000, have supplied the means for strengthening and advancing all phases of pharmaceutical education and practice. The list of 1957 patrons numbers 183 contributors to this Foundation. Of the many worthwhile programs supported by the American Foundation for Pharmaceutical Education, we relate only a few.

Programs. Throughout World War II this Foundation aided many schools and colleges of pharmacy which were in serious financial distress.

During these same war years, when enrollment dropped drastically in all colleges of pharmacy, the Foundation gave help in maintaining an intensive career promotion program.

The Foundation financed the long-range quality student recruitment program, under the auspices of the American Association of Colleges of Pharmacy. This recruitment program involved not only brochures entitled, *Shall I Study Pharmacy*, but likewise financed the production of colored movies and sound strips directed toward interesting the best students in pharmacy as a career.

One of the larger projects supported by this organization was financing of the Pharmaceutical Survey, which was directed by the American Council on Education. This survey, under the direction of Dr. Edward C. Elliott, was conducted between 1946 and 1950. The benefits coming out of this study have improved and strengthened, and will for a long time continue to improve and strengthen, all segments of pharmacy including the programs in education.

Each year since 1949 the Foundation has financed a pharmacy teachers' seminar. These valuable refresher training courses for teachers have considered not only programs involving pharmaceutical chemistry, pharmacology, pharmacognosy, and pharmacy administration, but a program involving a general seminar on how to teach and how to teach more effectively.

Since 1946, American Foundation for Pharmaceutical Education contributions have enabled the American Association of Colleges of Pharmacy to publish the *American Journal of Pharmaceutical Education.*

Since 1946, the principal support for the accreditation group known as the American Council on Pharmaceutical Education has come from this same foundation.

Every year each accredited school of pharmacy is given $400 in undergraduate scholarships. As of November 1, 1957, 1,655 students have received such aid.

Up to the time that this Congress convened, 396 Fellowships had been awarded by the Board of Grants of the Foundation. During this academic year, seventy-two Fellows of the American Foundation for Pharmaceutical Education are studying at twenty-four universities.

Many in this room are indebted for various contributions which have made possible either their undergraduate or graduate training. Both industry and our colleges owe a deep debt of gratitute for the support of this Foundation in many worthwhile projects, a few of which I have mentioned. Without its aid, our program in pharmacy could not have reached its present level of development.

SURVEY OF PHARMACY

Progressive faculties of our individual colleges have constantly surveyed their own curricula. They have been aided by two major surveys; the first, made possible by a grant from the Commonwealth Fund of New York, was under the direction of W. W. Charters, A. B. Lemon and L. M. Monell. This study of the "Basic Material for A Pharmaceutical Curriculum" was initiated in 1923 with the cooperation of the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, and the National Association of Retail Druggists. The objective of this project was "to derive a content of a curriculum for colleges of pharmacy from an analysis of responsibilities and the specific training needed for the neighborhood druggists to fulfill their obligations to the profession and to the community." This study was published in 1927 and served as a most useful reference for reorganization of training programs in light of the four year program which was required by all accredited colleges of pharmacy in 1932.

The comprehensive survey dealing with all phases of pharmacy including pharmaceutical education was conducted under the auspices of the American Council on Education and supported by funds provided by the American Foundation for Pharmaceutical Education. It was begun in April of 1946.

This survey was carried out under the able direction of Dr. Edward C. Elliott and an excellent committee appointed by the American Council on Education. This study truly has exerted and will long continue to exert a deep influence on the professional thinking and actions of pharmacy in the years ahead. Five important publications came as a result of this study: two general reports, *Findings and Recommendations of the Pharmaceutical Survey* and *The General Report of the Pharmaceutical Survey*; three monographs, *The Abilities and Interests of Pharmacy Freshman* by H. H. Remmers and N. L. Gage, *The Prescription Study of the Pharmaceutical Survey* by J. Solon Mordell, and *Student Personnel Studies of the Pharmaceutical Survey* by H. H. Remmers and N. L. Gage.

A further valuable outgrowth of this pharmaceutical survey is the report on pharmacy curriculum by E. L. Blauch and G. L. Webster. This report was prepared by the Committee on Curriculum of the American Association of Colleges of Pharmacy. Here we find elaborated the principal data and concepts that pertain to the findings and recommendations of the Committee on the Pharmaceutical Survey with reference to the general and professional education of the pharmacist. This book will serve as a basis for curriculum revisions which are so badly needed if we are to justify development of the new five year program in pharmacy.

PROBLEMS OF THE FUTURE

Whether our programs, as previously indicated, follow an integrated zero-five plan or a segregated one-four or two-three plan, the philosophy and objectives should be the same. We are now presented with a great opportunity to develop a creative program. We hope to avoid the mistakes which characterized the transition from the two to the three, and the three to the four year programs. It is not enough merely to add a year; we must define our objectives, evaluate course content and sequences, and recognize the necessity of including much needed courses in general education. Our present four year course suffers from academic anemia.

We find that in recent years more and more people in and out of educational circles are becoming concerned about the lack of general education in many of our professional programs. Some of us wish that we might have had the luxury of a four year program in a liberal arts school before entering into our professional training. Many critics of professional education have accused us of turning out highly trained technicians, but of having failed in developing those ideas and ideals which permit us to understand the world we live in, and of failing to produce trainees capable of assuming the necessary responsibilities of good citizens. We in pharmacy have not faced up to our responsibilities in *training for living* as well as we have *trained for making a living.* Whether such a revision of our curricula in light of training for citizenship involves integrated or segregated programs of instruction is not important. It *is* important that in our programs, whether zero-five, one-four, or two-three, we develop ways of realizing this objective.

A study of liberal education with special consideration on its relationships with the education offered in undergraduate professional schools and colleges will

soon be made by the Institute of Higher Education of Teachers College of Columbia University, under the direction of Dr. Earl J. McGrath, Executive Officer. It poses many interesting questions, the answers to which are important to those charged with developing programs in pharmaceutical education.

(1) Is liberal arts instruction stronger or weaker in professional schools which engage their own instructors in these subjects or where such instruction is given in a separate liberal arts division?

(2) Have the liberal arts colleges become so specialized themselves that students see no real advantage in attending these colleges and choose instead the more well-defined vocational objectives and opportunities offered in the professional schools?

(3) Have specialized programs of our graduate schools changed liberal arts college training from institutions offering a broad liberal education into training institutions for those who wish to enter graduate schools?

(4) Have the European universities been able to maintain liberal learning as a prerequisite to all higher education regardless of the student's educational or vocational objectives?

We await with interest the results of the studies of the Institute of Higher Education.

During the last half century we have seen a great increase in the two year colleges in our country. These junior or community colleges will assume a growing importance to our program because they will serve as one source of professional students. If their training is inadequate, we will face many and serious problems. If they can provide a comprehensive, well-planned preprofessional training, they can render us a valuable service: they can train candidates for either the one-four or the two-three programs.

The problem of undergraduate curriculum is by no means the only one. We must strengthen and expand our graduate program. We must recruit more students of higher quality. We must interest the qualified undergraduate in graduate training, whether for industry, research, or teaching. The most crucial need in pharmacy's future is to attract and to hold understanding and inspiring teachers.

The need for many more teachers is not unique in our profession. College populations are scheduled to double by 1965. To meet this challenge, we must first attract candidates to the ranks of teaching and then we must offer inducements to hold them there.

All of us who have continued in graduate school training know that it is costly. We realize the great importance of underwriting teaching assistants or fellows whether by industry, state, or federal grants.

We must stem the tide which is running against us when only one out of every four graduate trainees enters teaching. Not only must we show the many advantages of scholarly life in academic circles, but we must double present salaries and provide improvement in economic status by offering adequate accident and health insurance as well as a sound retirement system to swing the decision in our favor.

Our programs of graduate training must not reduce the quality of instruction for the sake of producing greater numbers of candidates. I must admit that I am *fearful that we may* and *hopeful that we will not* fall prey to the easy way out by diluting the quality of our instruction and turn out poorly trained teachers.

Again, without sacrifice of quality, we must explore ways to teach a larger number of students possibly through closed circuit television or greater use of audio-visual aids. We must increase efficiency without overtaxing teachers' energy by giving relief from routine clerical duties.

In creating scholars and in trying to increase research productivity we must not fail to see that recognition is also given to good teaching, and not solely to research.

The pressures on us to turn out more qualified teachers may necessitate consideration of giving added meaning to the master's degree. All too often in the past, a master's degree has fallen into disrepute in that it has frequently been granted as a "sign off" for a candidate not judged to be of Ph.D. caliber. We should strengthen the various training programs so that the awarding of the degree means something more than just a year or two in school above the baccalaureate degree.

The nature of pharmacy of the future rests very largely in the hands of those engaged in education. We are charged not only with the responsibility of training for the ever-changing retail practice, but we must recognize the many fine opportunities which present themselves in hospital pharmacy, manufacturing pharmacy, research, and in teaching. The great increase in newer specifics, the radioactive materials to come and the need for a better understanding of the biological subjects must be reflected in the revision and modernization of our professional courses.

The problem of ever-increasing leisure coming even to pharmacists must not be neglected in our training just ahead. It is hard to believe it, but many of our present graduates will be practicing pharmacy in the twenty-first century. Let us not handicap them any more than is necessary by a smug curriculum which has not been realistically tested.

It is important that we share our experiences in these matters concerning the future of pharmacy with our many friends in all the Americas. I only hope that the friendships developed at this Congress will initiate many cooperative projects in developing programs in pharmacy.

Some of your problems may be ours, as well. Some of our experiences may be shared with profit for all concerned. I know that I speak for our Association when I say that we stand ready to work with you in the best interest of pharmacy.

The future of our profession has never looked brighter. Let us all rededicate ourselves to high idealism tempered with reality, to vision seasoned with experience of the past, and to unbounded enthusiasm in training our candidates to offer public health service at a level undreamed of in years past.

Here is a great task for the professional schools of America to instill into their students the ideals and spirit of the professions they teach and to withhold their stamp of approval from those students who do not respond to such teachings.

Harmon W. Caldwell, Am. J. Pharm. Ed., 1, 32 (1937)

A NEW PLAN FOR PHARMACY EDUCATION

GLENN L. JENKINS

EVOLUTION OF PROFESSIONAL EDUCATION

Professional education in older times was carried out by transmitting the limited knowledge and art from generation to generation, from father to son, and from preceptor to apprentice. The paucity of learning was concealed from the citizens by secrecy. The invention of printing, the rise of the spirit of free inquiry, and organized research produced an abundance of facts and knowledge that made our modern university system of education possible. Starting as a simple course of organized lectures, the system has expanded to many courses and curriculums spread over an increasing number of years. The professions are now faced with the dilemma that the sum total and diversity of knowledge continues to increase while the time required of intelligent youth to qualify for professional acceptance has been expanded to the point of diminishing returns. There is no expectation that the rate of increase in knowledge will decrease but rather that it will increase in the future. It has been estimated that chemical data double every sixteen years. In the face of these facts it seems obvious that the answer to our dilemma is not an ever-increasing length in the time span of the curriculum.

EDUCATIONAL GOALS THROUGH THE AGES

In the past when man had fewer material comforts and the goal of education was to produce a knowing rather than a thinking intelligent man, culture required different things. Culture is a stage of civilization and the particular features of that stage. Throughout history the cultured man has been one with appropriate knowledge to fit his environment. The oriental, Greek, and Roman cultures were concerned with the body and the mind, little science or religion and much philosophy. It was a culture of mental and physical agility. The medieval era was obsessed with problems of the soul; the cultured man was a man of religion. Education in things of the soul was paramount over those of the mind and body, and metaphysics overshadowed physics. The monastery schools and the universities which flourished then were created to save men's souls, not to teach the making of a living or the rendering of service to mankind. The renaissance gave rise to the vernacular language and literature, putting Latin in the position of a dead language. The pagan arts were reborn, the advent of skepticism caused a shift to literature, and the arts and sciences were promoted in the spirit of free inquiry.

Today, none of the older cultures is dominant. Science, technology, economics, and politics direct the lives of all in this era.

THE OBJECTIVES OF MODERN PROFESSIONAL EDUCATION

The development of intelligence and culture are two of the most valuable assets that can be obtained from any educational effort. In addition we have a prime responsibility to train for professional competence.

By intelligence I refer to those inherent qualities of mind that are used in thinking, or clear, precise, and logical reasoning. This involves a keenness

of observation which is accompanied by the power of concentration and an accuracy of memory. It requires an orderly mind which permits of clearness of thought and a fine differentiation of ideas. It implies judgment, the careful evaluating of facts and the ability to correlate facts and ideas.

Culture on the highest plane implies refinement and an ability to live at ease and understanding in the most enlightened and cultivated personal surroundings. Among the usual connotations of the word are good taste, a broad general knowledge, and a familiarity and appreciation of our human and material environment.

Professional competence requires not only preparation for general practice but for hospital pharmacy, teaching, research, management, and production, and all areas that are an inherent part of our profession's responsibility.

CULTURAL EDUCATION IN THE PROFESSIONAL SCHOOL

Science is now recognized as the raw material of power—power for a nation, an industry, or a profession. Science is growing into a new "self-conscious" period of life because of its great scope and because of its influence on our general economy and on society. A new emphasis on general educational attainments, particularly in the social sciences and humanities, has arisen in our professional and scientific schools. This emphasis has developed in response to a recognition of the growing importance and increased responsibilities of professional and scientific men in our social structure.

It is my opinion that the curriculum in most schools of pharmacy provides the basis for a very liberal education. The history of pharmacy can be taught as a dry chronology of the evolution of our profession or as a subject that depicts the impacts of changes in commerce, society, and science from the time of the ancient trade routes from India through Arabia and Italy to Britain, and in the Greek, Roman, and western European eras to the modern times. Certainly, the works of a Pasteur, a Banting, or a Fleming are more important than those of an Attila, a Hannibal, or a Hitler.

Chemistry is one of man's finest creations. The knowledge of the constitution of matter, the structure of atoms and molecules, and the explanation of material phenomena is without doubt the most striking example of the power of the human mind. The whole of chemistry is a composition at which to marvel; the individual pieces of creative activity which have gone into its development are gems of beauty and esthetic delight to those who know.

Pharmaceutical jurisprudence can be taught as a recitation of narcotic, food, drug, and cosmetic laws, or it can be as certain a means of becoming liberally educated as any subject in a liberal arts college. The principles underlying the modern law of contracts, torts, real property, and the responsibilities of professional persons can trace the development of English law and human rights from the time of the Norman conquest to the present day.

Without attempting to minimize the importance of the liberal arts colleges, it is proper to point out that every course in the curriculum of a pharmacy college can and should be taught as a liberal, cultural subject in addition to teaching facts and how to use them. Such education can be designed to stir the imagination and to open the windows of the mind.

CHEMICAL AND MEDICAL EDUCATION PROGRAMS REVISED

In chemical education (1) the need to take advantage of student enthusiasm and motivation at an early date is emphasized.

Johns Hopkins University, which led in establishing the extended system of medical education, announced a revised program on April 19, 1957. The entire report is worthy of study (2) and is revealing. In brief, the report has uncovered three serious defects that have arisen from the present system, namely: (1) The combined undergraduate and medical curriculums have grown undesirably long; four years of college, four years of medical school, and an additional three or more years in a hospital. Doctors of medicine have reached the age of thirty before they have finished their formal education. Those interested in research have spent a number of their most promising years merely preparing for their careers. This demanding period of training, with its inevitable economic strain, has become so long that it is discouraging candidates from entering the field of medicine. In addition, it is forcing some graduates to enter practice before they have gained adequate experience.

(2) The sharp separation between premedical liberal arts education and the professional program causes the student to lose interest in everything except the technical requirements of his chosen profession.

(3) Faculty strengths in the basic medical sciences have tended to decline because of the proportionately less-attractive opportunities offered and the long period of training required, thus threatening the very foundations of the entire system.

The new plan proposes to counteract these deficiencies by (a) allowing selected students to enter medical school after two years of college; (b) providing integration of liberal arts and medical sciences; and (c) cutting a year off the period required for completion of medical school plus internship.

Similar opportunity must be preserved to permit schools of pharmacy to experiment with methods to improve the educational program.

Sir Francis Fraser, Director of the British Postgraduate Medical Federation, recently stated "while clinical medicine continues to depend to an increasing extent on physiology and biochemistry, it is looking now for its inspiration and its methods especially to the work of the physicist, the chemist, and the biologist." The same thing might be said even more truly of pharmacy. There is an increasing opinion that the educational programs, for example in chemistry, biology, and physics where the upper strata of students completing the undergraduate program are selected for graduate work, are superior to extended programs of professional education. Areas with extended professional programs such as medicine and dentistry have found it necessary to establish technician levels of training to meet practical requirements of service.

A PROGRAM FOR THE FUTURE

After the essentials for a sound education have been achieved as fully as possible within the framework of the present program, I recommend:

1. That the apprenticeship system as we have known it be abolished as a legal requirement for licensure. Voluntary apprenticeship would always be available. The old art and processes of collecting, grinding, preparing, extracting, and mixing drugs were almost ideally adapted to the concept

of a preceptor and a neophyte working together and the transfer of knowlege from master to beginner. The art of pharmacy has been largely replaced by science. The tempo of modern business does not lend itself to leisurely personal preceptorship.

2. That a prepharmacy year be required for admission to a college of pharmacy. This would provide a common basis for the selection of students who come from secondary schools where the quality and content of instruction vary widely. It also would permit the selection of superior students who have attained a sound background in literature and the arts.

3. A three year integrated course of liberal and professional education leading to the baccalaureate degree.

4. A year of specialization. In this year those who wish to enter general practice or hospital pharmacy would enter into a controlled experience plan under the joint supervision of the college faculties and licensure boards along the lines suggested by Busse (3). Approximately one-half of this year would consist of specialized instruction chiefly in the area of pharmacy administration and one-half year of experience under a competent preceptor. Those who wish to enter such areas as research, production, control, education, professional service representation, or industrial management would pursue advanced courses with graduate credit toward an advanced degree when qualified. Changing from one area of specialization to another would require repetition of the year of specialization.

5. A national examination for licensure so that educational attainment would be measured by performance rather than the number of years in the curriculum.

This plan not only would provide economy of time and money equivalent to the present program but would enable the graduate pharmacist to select the career of his choice after he had reached a mature level. It would upgrade the quality of instruction in our schools of pharmacy. It would insure the flow of superior students into advanced fields of study to provide the qualified manpower necessary to extend the frontiers of pharmacy through scholarly effort and research. It would give each school autonomy to emphasize areas of specialization where superior staff and facilities can be provided.

REFERENCES

(1) *Chem. and Eng. News,* 35, No. 38, 110 (1957).
(2) *Johns Hopkins Magazine* VIII, No. 11, June 1957.
(3) Busse, L. W., *J. Am. Pharm. Assoc., Pract. Pharm. Ed.,* 17, 459 (1956).

The thing which so long retarded the development of pharmacy, medicine, and the other sciences was the inclination of earlier generations to refrain from experimentation and thinking and to follow precedent, to accept without question, whatever had already been said or written about a particular subject.

Harmon W. Caldwell, Am. J. Pharm. Ed., 1, 31 (1937)

ARTICLES

STUDYING PHARMACY IN WEST GERMANY*

GLENN SONNEDECKER

The first president of the American Pharmaceutical Association, Daniel B. Smith, once said that German pharmacists earn the respect of others by paying it themselves to their profession. This respect survives — a dignity of self, of work, of learnedness for status as well as money — and so far shields German pharmacists from the more traumatic effects of the industrial revolution. The role education has played in protecting German professional standards seems as apparent as the differences from American patterns.

HISTORICAL BACKGROUND

The educational structure still reflects the traditional importance attached in pharmacy to the preceptor-apprentice relationship. Pharmaceutical education did not make firm connection with German universities until well into the eighteenth century, probably in part because of pharmacy's preoccupation with the preceptorship, partly because German universities, growing as they did out of medieval thought, were hesitant to enter upon education for the mundane and even manual work of the new scientific and technologic fields.

Pharmacy's tentative entry into the scientific professions came in 1725 with the Prussian obligatory examinations that represented specific requirements. Two years earlier a chair in pharmaceutical chemistry at the *Collegium medicum* of Berlin had been given to Caspar Neumann, perhaps the first of that eighteenth-century line of eminent pharmacist-chemists in Germany. Now, if one wanted to practice in a large city as a pharmacist in the grade "first class," he had to take a scientific course in Berlin and pass an examination at the *Collegium medicum*.

Before long, in regulations of 1737, pharmacy was recognized for the first time at the University of Göttingen. And from now on prospective pharmacists frequented the universities more often, even where no specific pharmaceutical program was provided. The first fully recognized academic instruction in pharmacy has been credited to the university in Ingolstadt, where it was developed by the pharmacist Georg L. C. Rousseau, who began as a demonstrator in 1760. Like the later and more famous Johannes Trommsdorff of Erfurt, Rousseau used the laboratory of his pharmacy for demonstrations and practical instruction.

By 1808 the academic needs and ambitions of pharmacy made university study obligatory in Bavaria, which was emulated by other German states. The definitive beginning of obligatory higher education in German pharmacy, from which the present system stems, may be considered to date from the regulation on examinations of 1875, four years after national unification (1).

Today pharmacy students may study at thirteen of the seventeen universities of the Federal Republic, including West Berlin, and at three of the eight technical universities (*Technische Hochschulen*) (2).

* This article was prepared at the invitation of the Editor. It is based on the literature cited and observations made by the author while in Germany as a Fulbright Research Scholar, 1955-56. The author is grateful to Mr. Walter R. Bückmann and Dr. George Urdang for their useful comments on the manuscript.

THE EDUCATIONAL SYSTEM

Until the present century German universities were organized into four faculties; theology, law, medicine, and philosophy. The natural sciences and sometimes other fields are now additional, separate faculties. Pharmacy finds its place, as one or several "institutes," within the Natural Science Faculty or the Philosophical-Natural Science Faculty (3). Pharmacy holds a similar place in the *Technische Hochschulen*. These technical universities are today analogous to the old-line universities except for their preoccupation with machine technology, building, engineering, electrotechnics, agriculture, and the like.

Still today, some universities and their pharmaceutical departments have not recovered from the erosion of the Nazi period and the cataclysm of military defeat. Nazification and de-Nazification, and deaths both natural and unnatural, gradually riddled the faculties; while at the end of the bombing about one-third of the institutions for higher scientific studies were almost wholly destroyed, eight others were about 30 per cent usable, six were 50 to 75 per cent usable, and another six were untouched (4). A number of the pharmaceutical institutes did not escape; so some continued to operate until recently in patched-up ruins (e.g., Frankfurt am Main); others were repaired or refurbished (e.g., Braunschweig); and a few that entered new quarters (e.g., Bonn) have few peers in architecture and facilities.

While the physical as well as conceptual patterns of German and American pharmaceutical education are interestingly different, one of the main differences can be seen only in terms of the system of pre-university education.

What are some basic assumptions that predominate in primary and secondary schools? In the foreground and persistent is the idea that adequate learning consists mainly of hard work in liberal amounts. Secondly, it is assumed that a rather severe intellectual competition will indicate what level of education (what terminus) is appropriate for particular pupils; and the differences in abilities and life goals require a variety of kinds of secondary schools. Finally, an assumption widely held is that learning of itself is virtue and education is a privilege.

Such assumptions led to practices sometimes considered "undemocratic," and reform has produced some modifications and continuing discussion. The essentials of the traditional educational structure remain, while recent changes tend to minimize the advantage of high social or financial status in the competition for higher education, and to simplify the school system and make it more uniform throughout West Germany. Naturally, the formidable task of rinsing National Socialism out of the school system had required other changes in both course content and administration.

Most youngsters attend the traditional free elementary school from ages six to 10 (*Volkschule*), which leads to competitive examinations for admission to a "Gymnasium." Prospective university students must graduate from this form of secondary school. Only 20 per cent of the pupils, or less, enter a *Gymnasium* from the fourth grade of the primary school (5).

In this minority, not more than one pupil out of four survives the nine years of *Gymnasium* study to pass the comprehensive examination that earns a "certificate of maturity." Since pharmacy students must be drawn from those who hold such certificates, it is understandable that we find little academic mortality in pharmaceutical education itself.

Here in the secondary school a prospective pharmacy student receives his "general education." The consensus seems to be that this equals at least two

years of junior college or preprofessional university study in the United States. It is a liberal education but a rigid one, permitting no "electives." The student chooses a *Gymnasium* that focuses the curriculum in a particular way — the *"Humanistisches Gymnasium"* emphasizing classical languages, the *"Realgymnasium"* permitting a final emphasis either on a modern language sequence or on science and mathematics (6).

When he makes his *"Abitur"* our prospective pharmacy student has been at school thirteen years or more and is at least nineteen years old. But he cannot yet earn credit for academic studies in pharmacy anywhere in the Federal Republic.

First he must accumulate two years of experience as a *Praktikant* in one of the teaching pharmacies authorized for this purpose by the Minister of Interior. Although all establishments called pharmacies are exclusively pharmacies, I was told that a good many of them could not qualify for preceptorships; it has been reported that only about 14 per cent are designated for this educational task (7).

The *Praktikant* keeps a daybook of his professional experiences and builds a herbarium and practical knowledge of botany; he becomes adept at drug assays and other pharmacopeial tests, using equipment kept in pharmacies (although now little used in practice); he learns the ways of the shop and all the small-scale manufacturing technics and simpler chemical processes, accompanied by studies in a learner's text (8).

The pharmacy student demonstrates what he has learned during these two years at a government examination (*Vorprüfung*) both oral and practical. Typical questions? Identify ten plants, giving their origin and pharmaceutical use and their chief adulterants. Describe the preparation of substances and compound drugs of the pharmacopeia and indicate possible adulterants or imitations. On the practical part: Make galenic and chemical drugs of the pharmacopeia. Test two drugs prepared according to the pharmacopeia and explain the chemical and physical processes concerned. Read and fill five difficult prescriptions (including narcotic; sterilization; homeopathic) and calculate the dispensing fees. The results of this preliminary examination determine admissions to pharmaceutical study in a university.

UNIVERSITY STUDENTS

Two years in a teaching pharmacy, after graduation from a *Gymnasium* at nineteen or so, makes the average student older than his American counterpart in age and attitudes.

In a German university at large about 36 per cent of the students are twenty-five years of age or older, proportionately twice as many as in the United States. Conversely, only about 4.6 per cent of German university students (in 1953) were younger than twenty, as compared with about 44 per cent in the United States (9).

After German wars, won or lost, there has been a boom in higher education. After World War II university students numbered about 170 per cent more than just before the war; while the corresponding figure after World War I was not more than 50 per cent higher than prewar (10).

In pharmacy the number of students has been relatively stable, although mirroring general trends. Since the turn of the century enrollment has usually totalled between one thousand and two thousand students, except under emergency conditions. Pharmacy enrollments increased sharply after World War II, as in

universities at large, despite a divided Germany. Approximately 3,500 pharmacy students are now studying in the *Universitäten* and (about 20 per cent) in the *Technische Hochschulen.*

The pharmacy enrollments in relation to total enrollment in higher intellectual studies have varied since 1949 between 2.4 per cent and 2.7 per cent. For the year 1953-54, some of the other professional areas admitted, in per cent of total enrollment:

Law	10.5
Machine and electrical engineering	9.8
Medicine	8.5
Theology	5.5
Music and painting	3.3
Pharmacy	*2.5*
Dentistry	1.9
Veterinary medicine (11)	1.2

In Germany there are about five times as many women among the students of pharmacy as there are in the United States. About half the pharmacy students now are women, compared with 21.8 per cent for the university population at large (12).

The higher institutions of learning that teach pharmacy range in size between 2,000 and 11,000 students. The various institutes and seminars still are scattered about old university cities, although new planning and building tends towards unification, with dormitories and a "student union" building. Probably about a tenth of the students live in dormitories; nearly a third with their parents.

The tradition of the "wandering scholar" has not been entirely lost. About a third of German students still change universities at least once, learning to know different intellectual climates and comparing the viewpoint and interpretation of different professors on the same subject (13). Today in a technical field such wandering has its disadvantage, although the practice is fairly common among pharmacy students, especially in South Germany.

PHARMACEUTICAL INSTRUCTION

Offering a curriculum in pharmacy impels a university to have certain pharmaceutical institutes for instruction that is specifically pharmaceutical. While no "school of pharmacy" exists in an American sense, it is said that facilities for earning a pharmaceutical diploma are more closely knit and unified than might be discerned at first blush.

Ordinarily there will be an institute for pharmaceutical chemistry, for galenic pharmacy, probably for pharmacognosy. Pharmacognosy may be a part of the botany institute, which is also within the administrative division known as the Faculty of Natural Science. Pharmacology will be found under the Faculty of Medicine.

These institutes are staffed by a somewhat limited number of men in the regular, full-time professorial ranks, plus a reservoir of postdoctoral aspirants to regular faculty positions, and various part-time and special personnel that cannot be characterized here in detail. Doctoral study was discussed in the Winter issue of the *Journal*; but it seems appropriate at this point to say something about the qualification and circumstance of the teaching staffs.

After receiving a doctorate, the aspirant to an academic position will serve as an apprentice to a particular professor. Such an *Assistent* sometimes thinks of

himself as part of an oppressed class, whose income and career prospects are tied too closely to the will and the fate of the *Assistent's* professor. After about four years (more or less) in academic work — assisting in teaching, research, and administration — an *Assistent* either is judged qualified for *Habilitation* to the regular faculty, or he leaves for a nonuniversity career.

For *Habilitation* a man must complete a research project more demanding than his doctoral work and stand a further examination upon presentation of this second dissertation. An *Assistent* makes his *Habilitation* at age thirty-three on the average; receives a call to a professorial post after perhaps another seven years. At first he will lecture as a *Privatdozent*, passing from this probationary status to a post as *ausserordentliche Professor* (similar to assistant professor or associate, U.S.A.) or perhaps *ausserplanmässiger Professor* (a supernumerary position). To reach the highest rank, *ordentliche Professor*, may take another ten to twenty years, I should judge, if it is achieved at all.

About 30.5 per cent of the teaching staffs (*Lehrpersonen*) in scientific higher education were *Lehrstuhlinhabern* (i.e., extraordinary and ordinary professors), when last surveyed (14). In these two highest, full-time ranks, only about one-fifth of the men are less than forty-nine years old, but in the natural sciences almost twice as many. In the faculties of Philosophy and Natural Science, which include pharmacy, there are four times as many students for each professorship as there were a century ago (ten in 1850; forty in 1953). It is still more striking that in pharmacy there are 157 students for each *Lehrstuhlinhaber*, the highest ratio of any professional field (average: fifty-three to one). When all teaching personnel, including scientific helpers, are considered, there are twenty pharmacy students to one staff member, or twice as many students as the average of all departments (15).

German teachers of professorial rank, it seems to me, have commendable conditions and freedom for their scholarly work, a high prestige (higher than in the U.S.A.), and the full professor (*ordentliche*) at least may be considered well paid (16).

The university system tries to assure the students, as well as faculty, a degree of freedom seldom achieved in American universities. The student should be able, ideally, to hear the lectures, do the reading, and enter the discussions that he believes will best fulfill his interests and goals. The university faculty and facilities are there to give him as much help as he seeks.

In practice, this looks quite different to students in scientific fields, including pharmacy, where course sequence holds first-rate importance, and especially when studies culminate in a state examination. For pharmacy students the curriculum appears to be laid down almost as rigidly as in the United States.

The pharmacy curriculum occupies three academic years — six semesters of three to four months each. The summer semester begins approximately in late April and the winter semester in late October.

Arriving at the university, a student registers, amid complaints about bureaucratic "red tape" that perhaps compare favorably in rancor with those heard here. To obtain credit for a semester, the student ordinarily must schedule at least twelve hours weekly. For a liberal arts major twenty to twenty-four hours weekly appears to be maximum, while a student of pharmacy, or of science or medicine, usually enrolls for more hours per week because of laboratory work and discussion groups.

If we examine the minimum program of pharmaceutical studies required for admission to the comprehensive state examination, the lack of "general education" is striking. This finds explanation in the rigorous instruction at the secondary schools, which—in language, literature, history, and the like—takes students at least to the level of two preprofessional years in the United States.

We are likewise surprised to find that dispensing and pharmaceutical technology hold no significant place. The universities usually assume that this is covered fully in the two pre-university years at a teaching pharmacy and in the one year of probationary practice that follows university study.

Botany and particularly chemistry find heavy emphasis. This includes more pharmacognosy than that which survives in most American schools, for the good reason that more of the pharmacist's work there concerns crude drugs and medicinal plant products, both for prescription use and home medication. Newer drugs are available, but it appears that older drugs frequently are used first, resorting to more potent or more expensive drugs as a second line of defense.

The biological sciences (zoology, physiology, pharmacology, etc.) have been less emphasized; and, as in the United States, sentiment grows for shifting more stress in that direction.

Instruction covers the fundamentals of the business management of a pharmacy, without giving it importance as a university subject comparable to that attached to it now in the United States (17).

Here are the basic studies prerequisite to taking the state examination, as laid down in the *Prüfungsordnung für Apotheker*:

(a) chemical, botanical, physical, pharmaceutico-chemical, and pharmacognostic lecture courses;

(b) two semesters in analytical-chemical practical work and four semesters of pharmaceutico-chemical practical work, with special regard for gelenico-pharmaceutical practical work;

(c) a half year of botanical practical work, followed by three half years of pharmacognostic practical work;

(d) a half year of physical or physical-chemical practical work;

(e) practical work together with lectures on physiological-chemical analysis;

(f) practical work combined with lectures concerning the fundamentals of bacteriology and hygiene, as well as concerning sterilization procedures, undertaken in the regular way and with success;

(g) a lecture course concerning the action of drugs and poisons, as well as the physiologic testing of drugs;

(h) a lecture course about the law of pharmacy and drugs;

(i) practical work together with lectures concerning homeopathy as it relates to pharmaceutical work; (18)

(j) a course in bookkeeping and tax and business matters (19).

Here is a modern curriculum patterned after the legal requisites described above, as it was proposed in 1956 for use at one university (Erlangen) (20). The numbers refer to the semester or semesters recommended for study of the subject indicated:

Lectures	Semester
Experimental Physics	1; 2
Qualitative Analysis	1
Organic Chemistry	1
History of Pharmacy and Chemistry	1
General and Systematic Botany	1; 2; 3
Genetics	2
Inorganic Chemistry	2
Stoichiometric Calculations	2
Pharmaceutical Chemistry	3; 4; 5; 6
Pharmacognosy	3; 4; 5
Pharmacology and Toxicology	4; 5
Natural History of Man (i.e., zoology interlaced with comparative anatomy and physiology)	4; 5; 6
Bookkeeping	6
Pharmaceutical Management and Law	6
Pharmaceutical Technology	6

Practical Training	
Analytical Chemistry	1; 2
Botany	2; 3
Pharmaceutical Chemistry	3; 4; 5; 6
Physics	3
Pharmacognosy	3; 4; 5
Theoretic and Practical Bacteriology	5
Physiologic Chemistry	6

It was recommended further that during the last half of the studies the student elect to attend additional lectures and practical work in the areas of physical chemistry, special organic chemistry, physiologic chemistry, physiology and zoology (21).

The teachers are expected to teach such courses the best they can, but not necessarily with the same scope or in the same way every semester. I got the impression that professors change their courses much more often, without formalities, in Germany than in the United States. It appears doubtful that an American student's charge that "that wasn't covered in lecture" would carry much weight in the Federal Republic, since full coverage of the subject remains available to the student in library books. Moreover, students are seldom pressed to attend lectures. It is understood that a student may feel that a particular lecture or group of lectures is not worth his time. In laboratory courses and some other practical courses the student must get the signature of his professor to certify satisfactory attendance, although I believe few if any professors actually check attendance.

The *Assistent* may hold a kind of oral colloquium with individual students at certain points in the study program; and on this basis additional laboratory work or reading may be recommended. Few other examinations are given; although an entrance examination to a seminar is not uncommon.

In general, only the final comprehensive examination at the end of the university studies has importance to the student. The state administers this examination through a commission consisting of university professors and of qualified pharmacists. The state examination, counterpart of our state board

examination, is given instead of the university's diploma examination in fields directly affecting public welfare (e.g., health, law, education).

If a student succeeds in this comprehensive oral and practical examination, he enters a year of probation in a pharmacy (as a *"Kandidat der Pharmazie"*), during which he is expected to extend his knowledge and demonstrate that he can apply it properly in practice (22). Thus he becomes a German *Apotheker*. It has been at least six years since his *Abitur*: two years in a teaching pharmacy (*Lehrapotheke*), at least three years of academic study (*Universität* or *Technische Hochschule*), and one year (with limited exceptions) of probationary practice as a *Kandidat* of pharmacy. The length of time from secondary school to full qualification in pharmacy is similar to that required in most other professions; and the social and professional status attached to pharmacy appears comparable likewise.

The German system of pharmaceutical education thereby replenishes a profession that numbered 6,385 pharmacies in the Federal Republic, staffed by 12,178 pharmacists (1956). That was one pharmacy for 7,700 inhabitants, a ratio maintained by a limitation on the number of pharmacies in the individual states (23). This limitation has been placed in question under the postwar constitution; and it remains to be seen what pattern of pharmaceutical conditions and regulations finally will emerge.

The ubiquitous druggists (*Drogisten*) and drugstores (8,495 *Drogerien*) in the Federal Republic do not come into focus here, since they have no connection with pharmacy. The *Drogist*, with some exceptions, has prepared for his occupation by apprenticeship only. His shop may be roughly visualized as a small, average (or below-average) American drugstore after removal of the prescription department, of all but the most innocuous drugs, and the soda fountain. The German pharmacy, in contrast, is always what we call a "prescription pharmacy" but often larger than its American counterpart, often strikingly elegant either because of ultramodern or antique appointments.

Undoubtedly the German system of pharmaceutical education has helped to foster and maintain the consistent professional character of German pharmacy. Is it too tradition bound, and in what direction will it change? Such questions are actively discussed, and a conference held at Frankfurt am Main in 1952 suggests that the period of time in a teaching pharmacy may be shortened by at least six months, with academic education being lengthened to eight semesters. The additional instruction, it is proposed, would stress pharmaceutical technology (also practice in clinic and hospital); biochemistry; medical terminology and fundamental concepts of medicine; anatomy and physiology (with practice in pregnancy tests and blood-alcohol tests); and pharmacology (24).

REFERENCES

(1) Hans Dieckmann, *Geschichte und Probleme der Apothekerausbildung in erster Linie in Frankreich und Deutschland* (Govi-Verlag, Frankfurt/Main, 1954), pp. 36-38; a valuable, useful book despite some errors and published criticism (e.g., *Deutsche Apotheker-Zeitung*, 96 [1956], 769).

(2) Universities of Berlin-Dahlem, Bonn, Erlangen, Frankfurt/M, Freiburg, Hamburg, Kiel, Mayence, Marburg, Munich, Münster, Tübingen, and Würzburg, and the technical colleges of Aachen, Brunswick and Karlsruhe.

(3) Only in the Free University of West Berlin is pharmacy a subdivision of the Medical Faculty.

(4) *Stifterverband für die Deutsche Wissenschaft, Jahrbuch 1955*, p. 14.

(5) The 80 per cent or so who remain in the *Volkschule* may continue study for four years more. At any time up to the seventh year, a pupil may transfer into a *Mittelschule*, which trains for trade and commerce and lower civil service positions, and there continue through the tenth year of his school career. Other pupils, who complete the studies offered by the *Volkschule*, often continue in a vocational school, either a part-time *Berufschule* (coupled with apprenticeship), or a full-time *Fachschule*.

(6) For a clear, concise discussion in English of the German educational system, see Alina M. Lindegren, *Germany Revisited: Education in the Federal Republic*, U.S. Office of Education, Bulletin 1957, No. 12, Washington, D.C., 1957, 107 pp.

(7) Heinrich Hornung, *Apotheken und Arzneimittelgesetzeskunde mit Geschichtlicher Rückschau* (Deutscher Apotheker Verlag, Stuttgart, 1955, 142 pp.), p. 72.

(8) E.g., Johannes Arends, *Einführung in die Praktische Pharmazie für Apothekerpraktikanten* (Deutscher Apotheker-Verlag, Stuttgart, 1957, 264 pp.), and small specialized manuals, such as Mannfried Pahlow's *Botanisch-pharmakognistische Lehrversuche für Apothekerpraktikanten* (Stuttgart, 78 pp.).

(9) *Stifterverband, Jahrbuch 1955*, p. 32, Germany for 1953; *The World Almanac* (New York, 1954), p. 479, U.S.A. for 1952.

(10) Kurt Ueberreiter, *A Statistical Postwar Survey on the Natural Sciences and German Universities* (Library of Congress, Washington, D.C., 1950, 31 pp. and charts), pp. 2 f.

(11) *Wissenschaft in Zahlen, Stifterverband für die Deutsche Wissenschaft* (Essen, 1955, 147 pp.), pp. 9 and 19.

(12) *Stifterverband . . . Jahrbuch, 1955*, p. 23.

(13) *Stifterverband . . . Jahrbuch, 1955*, pp. 54-55. Before the first World War at least two-thirds of the students attended two, three, or even more, universities in preparation for the diploma examination.

(14) Faculty data are taken from *Wissenschaft in Zahlen, 1955* (e.g., pp. 65; 85-87; 95; 103-5), except for a few personal estimates given to me in Germany.

(15) *Stifterverband . . . Jahrbuch, 1955*, pp. 108-9.

(16) For example, he may earn about four times as much as a skilled workman and retire on full pay. Because of the social leveling in Germany, however, this represents only a fraction of the salary — in proportion to the earning power of working classes — that he commanded in earlier times.

(17) If we were including the German Democratic Republic, other differences would have to be noted. For example, the pharmacy curriculum has been lengthened from three to four years, the two years of pre-university practical training have been abandoned, and substantial "general education" courses have been added in Marxism-Leninism, political economy, and German language and literature. (Dieckmann, *Apothekerausbildung*, pp. 194; 248-253.)

(18) This instruction is by no means outdated; homeopathy, born in Germany, retains its vigor there as a medical sect.

(19) From the *Prüfungsordnung für Apotheker* of 1934, as amended; in Dieckmann, *op. cit.*, pp. 242-243.

(20) The institute director primarily responsible for this curriculum, Prof. Dr. Otto Dann, took into account his first-hand observations of pharmaceutical education in the United States and an examination of Blauch and Webster's *The Pharmaceutical Curriculum.*

(21) To obtain information on the organization and history of the various faculties and institutes at a particular university, including some information on examinations and diploma requirements, one should ask for a *Wegweiser*; the timetable of instruction and faculty directory usually is called the *Personal- und Vorlesungs-verzeichnis.* Each manual ordinarily contains 100 to 200 pages and costs at least 1 DM locally.

(22) Exemptions of up to six months are allowed for those who are taking doctoral work at a university or who have war service.

(23) Data from *Apotheker-Jahrbuch 1957* (Wissenschaftliche Verlagsgesellschaft, Stuttgart, 1956, 524 pp.), p. 476.

(24) "Richtlinien für eine Neugestaltung der Pharmazeutischen Ausbildung," *Deutsche Apotheker Zeitung*, 93 (1953), 280-282; see also, *ibid.*, pp. 128-130; 213-214; and 390-393.

It is, furthermore, my half-formed conclusion that professional men are more deeply appreciative of the cultural effects of academic courses and curricula than are the academically-minded professors mindful of the possible cultural effects of the professional courses and curricula.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 259 (1937)

A COURSE IN PHARMACY ORIENTATION

C. LEE HUYCK

At the present time there appears to be two schools of thought as to the content of orientation courses in pharmacy. The first is the one expressed by Blauch & Webster (1) in which the following objectives are given for the course of the five year program: "(a) understanding of the nature and place of pharmacy in society and the responsibilities of the pharmaceutical profession, (b) general knowledge of the legal requirements, association, literature, and textbooks of pharmacy; and (c) appreciation of and interest in the moral standards and professional conduct required of a pharmacist.

"The subject matter for the course may be developed from several different points of view . . . . While the course should be inspirational and engender deep appreciation of pharmacy, it must have a substantial body of content worthy of credit as a college course." The following items are suggested as appropriate for the course in orientation: "(a) pharmaceutical services in society, (b) the development of pharmacy, (c) pharmacy as a profession and a business, (d) the agencies and means of communication in pharmacy, (e) the pharmacist as a professional man, (f) pharmaceutical education objectives, courses, curriculum, (g) how to study pharmacy." A catalogue description given as an example is as follows: "Pharmaceutical Orientation—This course is designed to acquaint the student with the history, standard textbooks, and various operations and processes which underlie practical pharmacy (three quarter hours)."

The second school of thought is to make the course strictly orientation as expressed by the Committee on Pharmacy of the Pharmaceutical Survey (2). This report recommended an orientation course in pharmacy or an elementary course in the history and ethics of pharmacy to precede General Pharmacy I (Preparations) of the four year curriculum. Two examples are given in the report on what the course content should be. The first was taken from the four year program at the University of Minnesota: "Orientation—A general survey of the field of pharmacy and related sciences including a cursory description of the courses offered in the pharmacy curriculum. The accomplishments and aims of some of the state and national pharmaceutical, medical and chemical organizations are presented. Credit, two quarter hours." The second is taken from the four year curriculum at the University of Mississippi "Orientation in Pharmacy—An introductory course including a brief history of pharmacy. Credit one semester hour." No fundamental principles are included either in the description or the examples given.

Some authorities think that when just orientation is given the course lacks "a substantial body of content worthy of credit as a college course." One of these authorities is Lee (3). He stated that a course in pure orientation would be satisfactory if sufficient material of importance could be found to draw up a logical syllabus. Because of his serious doubts that sufficient important material can be found, he suggested that this material be integrated into one or more other courses of the curriculum. Also, he pointed out that authorities in education have established the fact that orientation is a dynamic educational process that extends over the entire

college course. As proof of the soundness of this premise, the following conclusion of Williamson (4) of the University of Minnesota is cited: "Orientation . . . is not to be viewed as a fixed, pre-education exercise, but rather a fundamental part of the learning process itself within the university context."

Taking a look at general orientation courses, we find they are quite general in arts and science colleges and at universities throughout the country. Bookman (5) found that out of 143 arts and science colleges, sixty-one required an orientation course throughout the freshman year. Forty-nine of these colleges gave courses carrying credit. Arbuckle (6), Director of Student Personnel in the School of Education, Boston University, stated that these courses consider such problems as how to study, how to use the library, how to adjust to college life, how to prepare for a vocation, and are of questionable value. He points out that how to use the library for example is more meaningful when the students are taking a course in English. Blauch (7) in his "Teaching in Colleges and Universities with Special Reference to Dentistry" does not mention orientation courses or the orientation of the dental student, but we find that the St. Louis University School of Dentistry and the Washington University School of Dentistry in St. Louis do give courses in orientation. No orientation courses are given at the medical schools of either of these universities.

Orientation was recommended as a required course of the five year curriculum by the Committee on Curriculum (8) of the American Association of Colleges of Pharmacy. To quote: "The need, objectives and scope of such a course are described by Blauch and Webster (1). The course should not come later than the third year of the five year program and, depending upon the pattern of the curriculum, might well be given in one of the pre-professional years . . . ." Since Blauch and Webster are referred to, it is assumed that fundamental principles would be a part of the course.

The course in orientation at the St. Louis College of Pharmacy and Allied Sciences is a two-semester-credit-hour course described as "A general survey of the field of pharmacy with emphasis on the fundamental principles and practices." This course meets the objectives of Blauch and Webster (1) and covers all the topics suggested by them such as the pharmaceutical services in society, development of pharmacy, etc. As for books used in the course, three are especially recommended, and several copies of each are found on the reserve shelf of the library. They are *American Pharmacy* (9), *Fundamental Principles and Practices of Pharmacy* (10), and *Remington's Practice of Pharmacy* (11). These books must be consulted in order to be able to answer all the questions which are distributed to the class at frequent intervals.

EXPLANATION OF THE COURSE OUTLINE [SEE ADDENDUM]

As for the first topic "Why Pharmacy is a Profession and Not a Trade," the Charters (12) report, *Basic Material for Pharmaceutical Curriculum*, is cited, and the conclusions of the report are pointed out to the class. For the students who ask, "Why do we need such an extended education when so few prescriptions are compounded?" the conclusions of the Pharmaceutical Survey of 1947 are cited as follows: "The pharmacist must be a professional man who understands thoroughly what he is doing, who comprehends the scientific basis of drugs and drug action, who is able to evaluate critically

the products he handles, who is competent to advise physicians and members of the other health professions concerning drugs and their uses, who works at his profession creatively and advances its service." In addition, "The Pharmacists New Functions" as enumerated by Hardt (13) are written on the blackboard. They are (a) specialized retailer dealing in products for the treatment and prevention of disease, (b) business man who understands the economics of his job such as inventory control, (c) teacher of the people he employs, (d) therapeutic consultant to the physician, this being his most important function.

Under the topic "The Scope of Pharmacy," the article "The Structure and Stress of American Pharmacy" (14) by Sonnedecker, which appeared quite recently in the *Pharmaceutical Journal of Great Britain*, was mimeographed and distributed to the class. Parts of this material is emphasized as is the Briggs (15) address on the "Opportunities in Pharmacy." Because the majority of students go into retail pharmacy, our Professor Jack Cross of the Pharmacy Administration Department is introduced at this time. Last year he gave each student an outline of the "Facts and Figures of Pharmacy Today." The student copied the figures in the space provided on the outline as they were written on the board.

The material on "How to Study" is taken from the "How to Study" brochure by Thomas F. Staton (16). This brochure is recommended by the Psychology Department of Washington University in St. Louis to all their freshmen and adult education students and is the text in the "How to Study" course. Other excellent brochures by Kornhausen of the University of Chicago and Wrenn and Larsen of Stanford University are pointed out and placed on the orientation reserve shelf of the library. In the following class period the "Study Habits Inventory" objective examination by Wrenn of Stanford University is given. Following the administration of this examination the correct answers to the questions asked are given the student as he grades his own paper. If the total score is less than fifteen, indicating a great deficiency in study habits, the student is asked to examine each incorrect score with great care.

How to use the library is discussed by our college librarian, Miss Rose Brady. Again, a mimeographed outline is given the student covering the arrangement of books on the shelves of the library. The student is shown the position of the reference books, textbooks, periodicals, abstract journals, and current journals. In order to test his ability to locate this material in the library, a partial map of the library is drawn on the board. Sufficient information is given the student in order that he get his bearings such as the location of the card catalogue and the unabridged dictionary. He is then asked to locate a list of assorted books and journals on his map from the information that has been given him. Also, specific directions are given the student on how to find material in the library when some of the important information about the material to be found is missing.

For the history part of our orientation course we give the Parke, Davis "History of Pharmacy" slides. At the time the pictures are given, students are told that they will find several brochures on the reserve shelf of the library explaining the slides in detail. This is as far as we go on the history of pharmacy in this course because at the St. Louis College of Pharmacy all

students are required to take the history of pharmacy course directly following the course in orientation.

The literature of pharmacy is discussed by placing a sample copy of each leading periodical in the hands of each student. Various articles in the periodicals are given special attention because of their value to freshman pharmacy students.

Organizations of pharmacy are taken care of by the presidents of the various organizations in the St. Louis area as can be seen from the addendum. Each speaker is given five minutes to give the objectives and activities of his association. This amount of time appears to be the optimal since the speaker is not put in the position of prolonging his talk unnecessarily. For the remainder of the period an open forum is conducted on the subject of the accomplishments of pharmaceutical organizations.

The legal requirements including the apprentice requirements to become a pharmacist in the state of Missouri are discussed by an official of the state board of pharmacy. The apprentice requirements for our neighboring states which appear in our annual catalogue are written on the board. The balance of the hour is spent on professional ethics and the experiences of the Board of Pharmacy with violators of the state pharmacy law.

The remainder of the semester is spent on fundamental principles and processes of pharmacy. Time allows for only a very brief outline of each of these topics. Wherever possible the topics under discussion are demonstrated.

SUMMARY

Two ideas prevalent to orientation courses have been considered. We believe orientation in the strict sense of the word can be covered very nicely in about eight lectures or a little over 25 per cent of the class time. The remainder of the time can be spent on fundamental principles important in the study of Pharmacy I (Pharmaceutical Preparations). This belief is in keeping with the ideas of Blauch and Webster (1) and Lee (2) as well as authorities on college orientation courses such as Williamson (3) and Arbuckle (5).

ADDENDUM

Pharmacy Orientation — Fall Semester. Lecture and Class Discussions Two Hours Each Week. Two Credit Hours.

A general survey of the field of pharmacy with emphasis on the fundamental principles and practices.

Objectives

1. To understand the reasons why pharmacy is a profession and not a trade. 2. To understand the responsibilities of the pharmacist to society and the other health professions. 3. To understand the services of the State

Board of Pharmacy, the pharmaceutical organizations, and the current pharmaceutical literature to the profession. 4. To understand the reasons why high moral and ethical standards of conduct are required by the profession. 5. To learn some of the fundamental principles upon which the profession is based.

There will be an hour examination on the material discussed in class the last period every month.

Consult *American Pharmacy, Fundamental Principles and Processes of Pharmacy,* and *Remington's Practice of Pharmacy* on the reserve shelf of the library for information concerning questions given out in class at frequent intervals. Take notes on the material discussed in class.

Outline of Course — Subjects of Lectures

Period 1: Welcome to the profession of pharmacy. Dean Schlichting and/or Assistant Dean Thayer. Why pharmacy is a profession and not a trade. Period 2: The scope of pharmacy: retail, hospital, manufacturing, wholesale, government services. Introducing Assistant Professor Jack Cross of the Department of Pharmacy Administration. Period 3: How to study. See booklet by T. S. Staton, 2208 Woodley Road, Montgomery, Alabama. Period 4: Monthly test. "Study Habits Inventory," C. G. Wrenn, Stanford University Press. Period 5: How to use the library. Miss Rose Brady, College Librarian. Period 6: The history of pharmacy in pictures. Mr. William E. McCormick, Parke-Davis and Company (St. Louis Branch). Period 7: The literature of pharmacy. Professional journals are distributed and various articles are pointed out to show the value of each journal. Period 8: Organizations of pharmacy. Mr. Leroy Weidle, President St. Louis Branch American Pharmaceutical Association; Mr. James Koch, President, Missouri Pharmaceutical Association, Mr. Leonard Dueker, Vice President National Association of Retail Druggists; Mr. Carl Meyer, President, National Wholesale Druggists Association; Mr. Herman Winkelman, Secretary and General Manager of the Retail Druggists Association of Greater St. Louis; Mr. Edward Gilbert, Secretary, Mound City Druggists Association; Mrs. Florence Miller, President, St. Louis Branch American Society of Hospital Pharmacists; Mr. Walter Lutz, Fellow of the American College of Apothecaries; Mr. Starling Gansner, President of the Pharmacists in Industry of Greater St. Louis. Period 9: Legal requirements and ethics of the profession. How to become a pharmacist. Mr. Charles Riley, Secretary, Missouri Board of Pharmacy. Period 10: Metrology. Period 11: Specific gravity. Period 12: Measurement, generation and regulation of heat. Period 13: Monthly test. Period 14: Changes in matter caused by heat. Period 15: Comminution. Period 16: Solution. Period 17: Colligative properties of matter. Period 18: Isotonic Solutions. Period 19: Hydrogen ion concentration and pH. Period 20: The colloidal state. Period 21: Monthly test. Period 22: Emulsification. Period 23: Rheology. Period 24: Pharmaceutical separations. Period 25: Crystallization and granulation. Period 26: Chromatography. Period 27: Monthly test. Period 28: Extraction. Period 29: Sterilization. Period 30: Physical Properties and Molecular Structure. Period 31: Monthly test.

REFERENCES

(1) Blauch, L. E., and G. L. Webster, "The Pharmaceutical Curriculum," American Council on Education, Washington, D.C., 1952, pp. 157-158.

(2) Blauch, L. E., W. P. Briggs, L. W. Busse, A. I. White, and L. C. Zopf, "Pharmacy in the Pharmaceutical Curriculum, Preliminary Draft of a Report," p. 6, 1947 (mimeographed for The Pharmaceutical Survey).

(3) Lee, C. O., *J. A. Ph. A.*, 17, 659 (1956).

(4) Williamson, E. G., *J. Higher Ed.*, 26, 425 (1955) (through Reference [3]).

(5) Bookman, G., *Occupations*, 27, 163 (1948) (through Arbuckle, D. S., "Student Personnel Services in Higher Education," McGraw-Hill, New York, 1953, p. 76).

(6) Arbuckle, D. S., "Student Personnel Services in Higher Education," McGraw-Hill, New York, 1953, p. 76.

(7) Blauch, L. E., *et al.*, "Teaching in Colleges and Universities with Special Reference to Dentistry," American Association of Dental Schools, 1121 West Michigan Street, Indianapolis, Indiana.

(8) Parks, Lloyd M., *Am. J. Pharm. Ed.*, 20, 350 (1956).

(9) Lyman, R. A., and J. B. Sprowls, Editors, "American Pharmacy," Fourth Edition, J. B. Lippincott Company, Philadelphia, Pennsylvania.

(10) Burlage, H. M., J. B. Burt, C. O. Lee, and L. W. Rising, "Fundamental Principles and Processes of Pharmacy," Third Edition, McGraw-Hill, New York, 1956.

(11) Martin, E. W., and E. F. Cook, "Remington's Practice of Pharmacy," Eleventh Edition, Mack Publishing Company, Easton, Pennsylvania, 1956.

(12) Charters, W. W., A. B. Lemon, C. D. Monell, and R. P. Fischelis, "Basic Material for a Pharmaceutical Curriculum," McGraw-Hill, New York, 1927, p. 13.

(13) Hardt, R. S., *Drug Trade News*, March 9, 1955, p. 12.

(14) Sonnedecker, G., *Pharm. J.*, April 14, 1956; or *Chem. and Drug.*, 165, 199 (1956).

(15) Briggs, W. Paul, "Opportunities in Pharmacy," Career Guidance Conference Address, U.S. Department of Education, March 4, 1954.

(16) Staton, T. F., "How to Study," McQuiddy Printing Company, Nashville, Tennessee, 1954.

I would wish . . . that our state boards of pharmacy may continue if not as such independently, then as sections of general boards of health and sanitation. But this need not imply they themselves must be examiners. Rather, they should select examiners from among those who have specialized in education. . . .

Edward Kremers, Am. J. Pharm. Ed., 1, 300 (1937)

THE ENGLISH TEACHER TALKS BACK

CHESTER L. RIESS

I wonder if many of you have noted during the past few years the spate of articles in technical journals all bemoaning the state of the English language in the typical scientific report. Having witnessed for so long the rape of their native tongue in the name of technology, harassed editors and conscientious researchers have risen in indignition against the perpetrators of the crime.

It is curious to observe that English teachers have failed thus far to enter the lists. Is it because, as one writer insinuates, they are insufficiently interested? Or do they perhaps fear to cross swords with those men in white on professional school faculties who represent a higher order of mankind? I, for one, cannot resist the challenge, and should therefore like to present what I consider the general attitude of the English teacher towards the problem of raising the level of scientific writing, a problem, incidentally, to which A.Ph.A. publications have given no attention whatsoever. Naturally I have no way of knowing precisely on what issues my colleagues in English would agree with me, or on what issues, if any, I would find myself alone.

A critic begins his essay on a famous poet with a plug for the pharmaceutical industry: "Take an aspirin and a bromide before I utter the most frightful blasphemy that was ever uttered since Dr. Faustus signed his name to an infamous pact with the devil. . . ." (1) I feel it would not be inappropriate to borrow the critic's inflammatory remarks to utter some blasphemies of my own, inspired by the AAAS publication of papers delivered at the third annual Conference on Scientific Editorial Problems, and particularly the Association's re-publication of a piece by Dr. John R. Baker of Oxford University.

Let me begin, then, by making a few statements which many of you at best will think rash and ill-advised. I believe that much of the criticism contained in these articles is unjustified in the sense that it fails to take into account the special nature of scientific language; that it is confused in its inability to perceive the inherent dangers and disadvantages in the classroom study of technical writing *for the purpose of improving vocabulary and style;* and that the criticism is superficial in the sense that it does not strike at the fundamental causes of bad writing. All this is not to say that these articles lack value, that the English teacher can learn nothing from them. Indeed, he can learn much. The conclusions and implications to be drawn from the charges against the misuse of language in scientific papers, however, are of a different order from those envisioned by their authors; but this discussion must be deferred until I have offered some justification for my own criticism.

First, my belief that the charges of these writers are often unjust in the sense that they do not consider the special nature of scientific language. Dr. Baker, for example, begins his paper with the following complaint: "Many scientific papers published in Great Britain are written in a style quite different from that adopted by good English authors" (2). This is not only true, but as it should be. And when one discovers later that by

"good English authors" Dr. Baker means writers like Macaulay, Wodehouse, and Sir Winston Churchill, one wonders how clearly understood are the differences between the ideals of "literature" and those of the scientific report.

Perhaps the error that follows most generally from the failure to recognize the difference between the common garden variety of written composition and the technical article is the attempt to introduce the stylistic and rhetorical devices of the former into the highly specialized jargon of the latter. This unnatural flirtation with the literary muse among the test tubes and retorts of the laboratory leads to a shotgun wedding, the offspring of which inherits the worst features of both parents, and might be characterized by some of my pharmaceutical friends as an incompatibility. No effort to improve the writing of scientific papers can meet with much success if it begins by disregarding the distinction between the functions and problems involved in these two forms of composition: between the "expressive" and the "representative" functions of language; between realizing and naming; between simple explanation, and factual exposition involving formal analysis and exact measurement. Science might not have cut the throat of poetry, as someone in the eighteenth century once said, but certainly Lucretius is dead. Even Ruskin, who, one would suppose, represented the last brave attempt to introduce style, or "reverence" as he called it, into scientific writing, is also long since dead.

This is not the place to discuss the evolution of the scientific attitude, nor am I particularly equipped for such a task, but surely one aspect of its history is related to the problem before us. I refer to the gradual shift, since the days of Comte (and Ruskin), from a concern with metaphysical, hypothetical, or speculative entities, to the emphasis on the arrangement and correlation of measurable facts. The effect of this positivistic movement on language was the attempt to reduce scientific writing to propositions about observable objects of experience, to a precision of statement having only a denotative value, to a symbolism which employs a different term for each special relationship. Although such ideals were never achieved, the ordinary discursive language, the language of Macaulay and Churchill, filled as it is with emotional association, figures of speech, and hypostatization (A. N. Whitehead's "misplaced concreteness"), became suspect and no longer valid for technical exposition. For even when such writing is clear, lucid, and simple, it is at the same time too personal, or dramatic, too relaxed, too subtly organized, and too obviously delighting in its own locutions to provide a suitable medium for the scientific paper. The "abstract," brief and unadorned, the illustration, graph and diagram—these are the ideal forms toward which technical writing strives. Thus the scientific paper, unlike ordinary prose, has developed into a strange species of anti-language, a kind of unhappy compromise, conceived in pain and dedicated to the proposition that words are only necessary impertinences that must be tolerated until more efficient means of communication are discovered.

Now it has been suggested that "teachers of English in our schools could help very much if they were to study the errors made in scientific papers and base their instruction to science students on their findings" (3). And this brings us to the second point: the danger of studying this highly specialized writing to gain insight into vocabulary and style. I do not refer here to the grammatical or punctuation "errors" found in the average scientific paper,

or to its corrupt, admittedly unnecessary and often monstrous jargon, or to its often dull, humorless presentation of supposedly interesting material, but to the fact that there is an *acceptable* jargon, as well as an *acceptable* stylistic formula, and an *acceptable* organization that one departs from at his own risk. My point is that a steady diet of this sort of thing reduces the writing of a scientific report to a mere mechanical process because the very existence of a prefabricated linguistic structure obviates the need to think clearly, and finally makes thinking unnecessary.

Let me illustrate. Everyone admires the streamlined, push-button, $64,000-approach to learning; everyone is looking for the half-dozen simple rules; everybody wants short cuts. One of the most popular short cuts for teaching English composition today is the so-called consumable text, a series of exercises which are completed by the student and then removed from the book for correction by the instructor who has supplied himself with a "key" for the purpose. This book makes life a little easier for the teacher, is sound business for the publisher, since an eviscerated text cannot be resold, and perhaps gives some pleasure to the student who finds himself happily employed in tearing up his book. In Lemuel Gulliver's famous voyage to Laputa, a kind of eighteenth-century version of the mad scientist, Swift anticipates such ingenious pedagogy and even proposes a refinement. He suggests printing the exercises in a cephalic ink; the teacher is no longer annoyed with the mechanical task of correction, for the student chews up and swallows the page, thus allowing the ink to rise to the brain where the words impress themselves without any conscious effort. This method has not been tried, so far as I know, although a modern adaptation might be those psychological experiments (worthy of the Laputans) in which the "student" wears earphones in his sleep and absorbs his "knowledge" effortlessly and unconsciously through the repeated playing of a phonograph disc.

Now the whole point of this seeming digression is to enable me to say that in reading technical papers I often have the uncomfortable feeling that writers have read too many such papers, and in digesting them have permitted the characteristic clichés and circumlocutions to rise unconsciously to their brains. (You may, if you prefer, use the record-player analogy.) The writer has been spared the effort of verbalizing the facts for himself. The problems of writing have been solved here not by the painful and continuing struggle with words, but by permitting one compartment of the mind to become completely submissive to the readymade phrases that come trooping in. Under this strange state of semantic anesthesia, to give only one example, the victim cannot simply write *I think*; he must write *In my opinion it is not an unjustifiable assumption that*.

Our old friend Dr. Baker writes: "A strange fact that gives some basis for optimism is this, when an author has finished the scientific part of his paper, he often addresses a note of general information to the reader. At this point he suddenly discloses for the first time that he can write English, for his ideas are clearly expressed" (3). What is probably happening here is that the anesthesia is beginning to wear off. The author is gradually releasing himself from the hypnotic compulsion to be "scientific" at all costs. He is no longer the Univac automatically recording stereotype previously slipped into the machine, but a writer trying to express *himself*. "His ideas are *clearly* expressed" because he is beginning to think.

For the fact seems indisputable that the conjuring up of set phrases makes thinking unnecessary, or at best, precedes and even originates whatever thought there is. I have noted again and again that a student will write an absolutely meaningless sentence, or make a statement that he does not mean at all, and then will continue to defend what he believes to be his choice of words even after the enigmatic construction is pointed out. It is not until the spell wears off that you can get him to see what he has written. When asked just what he means, a fitting answer might be, "Wait, I'll tell you what I mean as soon as I am able to understand what I've written."

Perhaps one of the reasons for this not uncommon state of affairs is that in reading scientific papers those regions of the brain that do remain active and alert are concerned almost exclusively with subject matter. There is no time, or need, to appreciate style. Moreover, a style which called attention to itself in a technical article would be distracting; style is therefore controlled and subdued, making even less likely the reader's awareness of it as an element distinct from meaning. Learning to write, however, involves a keen awareness of words and their arrangement. The student must be immersed in the medium for long periods of time, and must even learn to delight in language as language. One of the best ways of accomplishing this verbal baptism and developing this delight without which the immersion is useless is the reading of good, nonscientific prose. Style is here often an end in itself, and can therefore be legitimately isolated and studied as an aspect of verbal communication.

I find myself in the last few paragraphs anticipating my last point; that is, the contention that the critics of scientific composition fail to strike at the fundamental causes of bad writing. This failure, I believe, results from the tendency to exaggerate the importance of grammar and "standard" English, and leads directly to the naive assumption that the weak writer can change the habits of a lifetime after his errors are pointed out and he is given some rules or principles to remember.

These critics begin, usually, by castigating the badly written paper for its "ambiguities" and "imprecise thinking," and then proceed to list examples of incorrect grammar and punctuation. Yet as I read I am unable to discover any clear indication of the causal relationship between "imprecise thinking" and misplaced commas, between "ambiguities" and the lack of agreement of verb and subject. Even when the relationship is perceived it comes with something of the shock of an original discovery. Thus a Mr. Townley writes: "A common error is to omit the comma before a nondefining clause; although I call this an error, the normal result for the reader is ambiguity" (4). The statement, of course, is quite true, although I would put it the other way around and say that one of the normal results of a confused or ambiguous state of mind is to omit the comma before a nondefining clause. Such reasoning is not always correct, but I have found it worth considering in dealing with my own students. You cannot cure a disease by treating its symptoms.

I am even sanguine enough to believe (on the basis of experiences with some of my better students) that the author of a badly written scientific article knew the rules of grammar before he wrote, or that if he did not he was intelligent enough to have studied them. Unfortunately there is as little guarantee that one can write correctly (or interestingly or forcefully)

by learning grammar as there is in believing that one can think rationally by memorizing the laws of logic. The web of words in which the writer has entangled himself is often beyond grammatical analysis until there is some understanding of the confused state of mind which called it forth.

While such an individual must learn to think before he can be taught to write, he must be carefully distinguished from the individual whose grammatical slips represent the kind of carelessness to which everyone is prone. There is a significant difference between an error which represents an ambiquity, and an error which has no influence on meaning. It is one thing for the writer to use an incorrect form of the verb because by the time he got to it he forgot whether he happened to make the subject singular or plural (inattention to form); to use the incorrect form of the verb because he forgot what the subject was (inability to think straight) is quite another matter. In spite of the laments of scientific editors (5), I can understand the resentment of the writer when his attention is called to what he considers a minor matter, as I can understand the resentment of the man who is so absorbed in what he is saying that he forgets to observe certain traditional formalities when a lady enters the room.

I think we must admit, too, that many of these traditional formalities are being discarded, so that the once-accepted standards of behavior, like the once-accepted rules of English, are no longer followed by some of the best people. Indeed the best writers of our time, at least those who have received greatest critical acclaim, seem to have learned rules only to demonstrate how effectively they can be broken, a general decadence, if you will, for which the "lax discipline of the English classroom" cannot be blamed.

It is true that the hard-pressed grade school teacher is still fighting a rear-guard action against the universal disregard for standards, inventing her poor rules as she goes along (knowing well that the college professor will deny them all): battling loose, run-on sentences and lack of subordination by stating incorrectly but authoritatively, "You may not begin a sentence with *and* or end it with *of*"; fighting all the *Go Slow* traffic signs by asserting (incorrectly but authoritatively) that the adverbial form of *slow* is *slowly*. But what can she say (or, for that matter, what can Dr. Baker say) when Churchill himself defends *It is me?* What can she think about the value of teaching grammar (or what can Dr. Baker think) when she finds Macaulay writing: "Give a boy Robinson Crusoe. That is worth all the grammars of rhetoric in the world"? Could Sinclair Lewis have been talking sense when he began his address before a class in creative writing at Columbia with the words: "I understand that most of you would like to write some day. Well, what in hell are you doing in school? Why aren't you at home writing?" Could Saroyan have been talking sense when he stated his First Rule in a list of rules for would-be authors? "Do not pay any attention to the rules other people make. . . . They make them for their own protection, and to hell with them" (6). No wonder that at least one scientific editor feels like throwing in the sponge: "I still hold out for the correct cases in pronouns, although I am weakening, and may in another ten years yield to such an expression as 'It was him.' But I have given up worrying about *shall* and *will*, split infinitives and terminal prepositions. I make my suggestions, and the author can take them or leave them. After all it is his grammar that the reader will judge, if indeed the reader pays any attention" (7).

But the most bitter pill to swallow (I use pharmaceutical figures of speech wherever possible) is the knowledge that if you are old-fashioned enough to believe in the value of grammar, even successful (after the mechanical repetition of drills and the consumption of a consumable text) in teaching it, even then your poor students will not write well. I suppose you cannot ask for too much; they still have nothing to say, but now they say it correctly; they are still dull, but grammatically dull. Let us face it: some people can never learn to write well, just as some people can never learn to play the piano well.

Harlow Shapley has this to say about the literary efforts of scientists: "They have not the time to be lucid on our level and within our vocabulary, or perhaps their mental intensity has stunted the faculty of sympathetic explanation" (8). Certainly one of the prize euphemisms of our day, a collector's item, is this attempt to record the simple and obvious fact that some scientists cannot write by stating that "their mental intensity has stunted the faculty of sympathetic explanation." Thus has the cult of science elevated the scientist to the point where a particular disability springs from a genius which transcends ordinary human capacities.

Finally, the failure to strike at the fundamental causes of bad writing is related to the readiness to disregard as irrelevant certain physical, or mathematical, considerations. Because more papers are being written today than ever before, there is a demand for space which even the great increase in the number of technical journals has failed to satisfy. This means that the cost per page has gone up, and that therefore there is no longer any room, as there was fifty years ago, for the carefully and leisurely written expository essay with its "natural philosophic content that once made science an accepted and essential part of every scholar's training" (9). It means, too, that to be acceptable, the research report must be so stripped of purely explanatory material that the reader is often left in doubt as to its significance or setting unless he is willing to read all the sources referred to in footnotes and bibliography.

Add to such purely physical considerations the fact that the writer is often rushing into print to beat some possibly unknown and unworthy competitor to the punch, or, already "overburdened with excessive teaching loads" (10), is attempting to satisfy his employer by fulfilling a required quota of published articles (11), and we can sympathize with the lack of incentive for achieving a distinctive style. After all who will read his report when it is published, or *how* will it be read? Scientists are busy men: not only do they lack the time to write "lucidly," but even the reading of the technical report has been recently described as "one of the chief bottlenecks in the work of the chemist or chemical engineer" (12). The specialist will skim hurriedly for its conclusion, its methodology, or its possible relevance to his own particular problem. Later, if the article does have some value, it will be read in the form of its final apotheosis—the "abstract"—and often only then because its "readers" have no wish to waste their time doing the same thing all over again.

Must we conclude on so unhappy and defeatist a note? I think not. There are lessons to be drawn from this analysis both for the English teacher and the scientific editor.

As for the English teacher, he must learn to justify every rule he teaches, and show, wherever possible, how the rules of writing, like the laws of science, are made by man as a result of the application of reason or special method to a particular order of facts. He must show that the rules do not precede or impose themselves upon language but are generated by it, just as the laws of science are intellectual formulations generated by the phenomena they describe.

He must learn to accept and deal with technical writing not as a perverse and unnatural form of jargon, a glorified shoptalk outside the main stream of culture, but rather as the necessary and justifiable result of specialization. He must hope that the natural evolution of the language will gradually eliminate what is awkward and unnecessary, but at the same time be willing to grant to those who work in highly specialized fields the right to choose those expressions which seem at the moment useful to them.

As for the scientific editor, he must also accept the fact that grammatical rules, like scientific laws, are subject to change, and that his corrections are sometimes as presumptuous as the writer's resistance to them. But he must also understand that the genuine improvement of writing involves a rapport with the mentality of the author, and has as little to do with grammar and punctuation as the elementary school teacher's insistence on neatness and proper margins.

He must realize, finally, that unlike the situation in "literature," there is really no *tradition* of good technical writing, and that he is consequently faced with a kind of dilemma. Can Dr. Baker really get his technical articles written in the style of "good" authors like Macaulay and Churchill—without sacrificing the scientific ideals of brevity and distinterestedness? A pharmacologist of the University of California School of Medicine offers the following advice: "Try to make your paper, even though it be highly technical, as interesting as you can. . . . Writers today are not only afraid of romance—they even fight shy of humor" (13). We are not told, however, how this can be accomplished in an impersonal, densely packed report which must not depart from a certain formal and expected organization. Indeed it seems to me that the author is involved in a paradox when he says later in the same article that "a good illustration . . . . may save you much verbage . . . . Make your paper as short as you can. Then make it still shorter" (14). What happens to "romance" and "humor"?

Now you cannot have your cake and eat it. Yet, as an English teacher, and as one who is aware of the cultural impact of modern science, the possibility of fusing two distinct styles poses an interesting problem. Certainly there would be danger in encouraging a "literary" manner where there is neither taste nor inclination. (Nothing is more depressing than false ornament or the academic joke.) But one wonders if a piece of writing might be objective and still carry a sense of personality. Would the most famous article on specific gravity have been improved if the reference to Archimedes' bathtub and the highly emotional, and unnecessary, remark, *"Eureka,* I have it," were omitted? The writer is probably delighted with his conclusions; he experiences a sense of eagerness, of intellectual excitement, in getting them down on paper; would it be possible to express this delight, this eagerness and excitement, not directly, perhaps, but by innuendo or sentence rhythm?

Would this mean a loss of dignity? Would objectivity be thereby destroyed, or would it be merely seasoned? This presents a challenge as well as a dilemma.

REFERENCES

(1) Rascoe, Burton, "Titans of Literature from Homer to the Present," G. P. Putnam's Sons, New York, 1932, p. 276.
(2) Baker, John R., *Science*, 123, 713 (1956).
(3) *Ibid.*, p. 714.
(4) Townley, K. A., *Science*, 121, 535 (1955).
(5) Arader, Harry F., *Science*, 121, 537 (1955).
(6) Saroyan, William, "The Daring Young Man on the Flying Trapeze," Modern Age Books, New York, 1937, p. XII.
(7) Miller, Robert C., *Science*, 121, 528 (1955).
(8) Shapley, Harlow, Samuel Rapport and Helen Wright, Editors, "A Treasury of Science," Harper & Brothers, New York, 1946, p. 6.
(9) Meyerhoff, Howard A., *Bulletin of the Atomic Scientists*, 12, 334 (1956).
(10) Powers, Justin L., *Am. J. Pharm. Ed.*, 20, 25 (1956).
(11) Young, Frank N., and Sears Crowell, *The A.I.B.S. Bulletin*, 6, 13 (1956).
(12) *Chemical and Engineering News*, 33, 1520 (1955).
(13) Anderson, Hamilton H., *The Bulletin, Amer. Soc. Hosp. Pharm.*, 12, 516 (1955).
(14) *Ibid.*, p. 517.

An attempt to interest the student pharmacist in a given subject by selling him the idea of desiring knowledge of that subject for its own sake would be more likely to be effective than such an appeal would be to students in general.

W. L. Van Buskirk, Am. J. Pharm. Ed., 2, 337 (1938)

A FIVE YEAR GRADE STUDY OF PHARMACY STUDENTS IN THE COURSES PHARMACEUTICAL CALCULATIONS AND INTRODUCTORY PHARMACY*

HENRY M. BURLAGE

With the five year course of study becoming a requirement in the accredited colleges and schools of pharmacy by 1960, the educators in these institutions are faced with the problem of using the additional year of instruction most effectively. It is not the purpose of this presentation to enter into a controversy with the proponents of the program with two years of prepharmacy but rather to indicate certain dangers arising in the assumption that this plan is the *only* one that should be recognized. It would be a tragic mistake to "strait jacket" our colleges into a single pattern now that we have "begun to grow up." As the Chairman of the former Pharmaceutical Syllabus Committee, the writer fully recognizes the fatality of such restrictions since the "Pharmaceutical Syllabus" lost its standing even though it was merely attempting to establish *minimum requirements* of subject matter for courses, which were then recognized as necessary in a four year pharmaceutical curriculum.

Two subjects which received considerable attention at the Teachers' Seminar on Pharmacy held at Butler University in August, 1955, were pharmaceutical calculations (pharmaceutical mathematics, pharmaceutical arithmetic, etc.) and introductory pharmacy (pharmaceutical technique, principles and processes, etc.). The offering of the two courses as well as some others has been criticized by some as unnecessary duplication of subject matter which the student is expected to get in courses in chemistry, physics, etc., either as a regularly enrolled student in the university or college where he was pursuing pharmaceutical training or as a transfer student from a junior or senior college; such offerings may be criticized even more vigorously in light of a five year course of study.

It is one of the purposes of this paper to indicate that, unfortunately, this assumption may be unfounded in many instances. Furthermore, under the five year program, this assumption as to what basic tools a prepharmacy student might be expected to have mastered if transferring to the one-four or two-three programs might prove to be especially serious; as, for example, the very important course—organic chemistry (one year). This subject in some junior and even senior colleges is taught by poorly qualified teachers with the result that the transfer student from such institutions is lacking in the basic techniques and principles which he is expected to possess. In fact, the writer was recently told that one reason one of the accredited colleges of pharmacy chose the one-four program was to be assured that the student acquired the course in organic chemistry at its institution rather than transferring the course in for credit; and if the course was to be transferred the student might be expected to pass satisfactorily an achievement test in the course before transfer credit would be assured. This matter was also discussed at the 1956 meeting of the AACP.

* The author wishes to express his appreciation to Dr. Ralph Eldon Lane, Associate Professor of Mathematics, Department of Mathematics, The University of Texas, for his suggestions and examination of the data that were tabulated.

The University of Texas is located in a state which ranks fifth in the number of junior and senior colleges and universities and possibly has the greatest number of state-supported institutions in these categories. Therefore, in the establishment of the forthcoming five year curriculum, with the majority of the colleges or schools of pharmacy concerned with one year or two years of prepharmacy, the problem of transfer credit with the more important hope of having properly trained transfer students has become of concern to the College of Pharmacy at The University of Texas particularly with respect to selective admission to the professional work of the sophomore year under the four year program.

This paper, therefore, deals with a five year analysis of the attainments of students in the two courses mentioned above, i.e., pharmaceutical calculations, a two-semester-hour course, and introductory pharmacy, a three-semester-hour course of two didactic hours and one three-hour laboratory period. One didactic hour is devoted to orientation in pharmacy and the remainder of the course to fundamental principles and processes.

In the fall or first semester only the grades of transfer students taking the courses for the *first* time are considered, and in the spring or second semester both groups are considered, with the majority of the grades being those made by students entering the college directly from high school.

It will be observed from the data presented in Tables I and II and Graphs I-IV that, in general, there are more A grades in pharmaceutical calculations made by the students entering college immediately from high school than by the college transfers. There may be several reasons for this: (1) the student, having been exposed to the material presented at a low level, feels that he understands it, whereas he is only slightly familiar with the terminology but has no real concept of the principles involved—as, for example, the concept of percentage; (2) the simplicity of the course for the college transfer which often leads to neglect of study of the subject matter and even carelessness, which is fatal; (3) more recent contact of the high school graduate with numbers and simple arithmetic.

On the other hand there were fewer D and F grades made by the college transfers, which might indicate an over-all experience acquired by one or more years of study above the high school level. It is this experience that should have been reflected in more superior marks but does not appear striking in this five year study.

It would appear, therefore, in line with the consensus of those individuals attending the Teachers' Seminar on Pharmacy that until such time that the marks made by transfer students are strikingly superior to those made by the recent high school graduates this course should be taught as a separate one and not integrated in the more advanced courses on pharmacy; it should be given in either semester of the second year of the one-four program. To take for granted that the student will acquire an accurate knowledge and facility if the material is integrated in other pharmacy courses may be an unwarranted assumption; however, once this is assured in the five year program, then it most certainly should be discontinued as a separate course.

In the examination of Tables I and II and Graphs VI-X it will again be noted that in each spring semester of the five year period, the students entering the college immediately after graduation from high school had a greater percentage of A grades in introductory pharmacy than the transfer

TABLE I

PERCENTAGE OF GRADES MADE BY STUDENTS DURING THE YEARS 1950-55

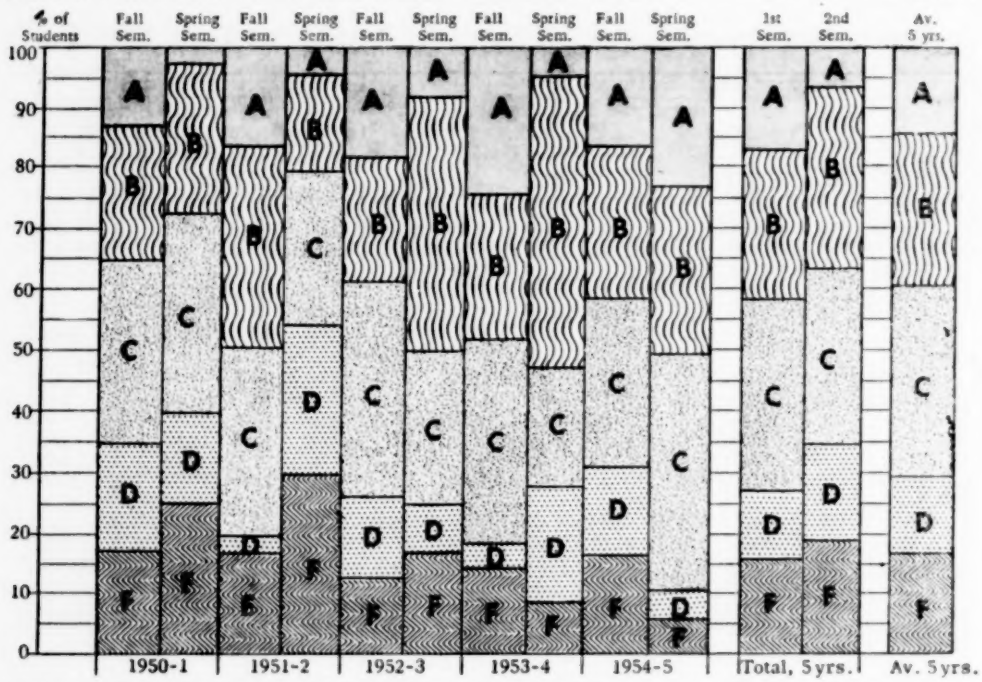
	Pharmaceutical Calculations						Introductory Pharmacy					
	Transfers*				High School Graduates**		Transfers*				High School** Graduates	
Year	Fall Sem.		Spring Sem.		Spring Sem.		Fall Sem.		Spring Sem.		Spring Sem.	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1950-1												
A	9	12.33	1	2.50	9	22.50	2	2.90	0	0.00	2	4.65
B	17	23.29	10	25.00	5	12.50	11	15.94	2	4.44	7	16.28
C	22	30.14	13	32.50	6	15.00	41	59.42	26	57.78	14	32.56
D	13	17.81	6	15.00	9	22.50	5	7.25	10	22.22	7	16.28
F	12	16.44	10	25.00	11	27.50	10	14.49	7	15.56	13	30.23
Total	73	100.00	40	100.00	40	100.00	69	100.00	45	100.00	43	100.00
1951-2												
A	6	16.67	1	4.17	5	13.16	6	12.00	1	3.70	3	8.57
B	12	33.33	4	16.67	10	26.32	11	22.00	6	22.22	8	22.86
C	11	30.56	6	25.00	6	15.79	17	34.00	14	51.85	16	45.71
D	1	2.78	6	25.00	9	23.68	12	24.00	5	18.52	3	8.57
F	6	16.67	7	29.17	8	21.05	4	8.00	1	3.70	5	14.29
Total	36	100.00	24	100.00	38	100.00	50	100.00	27	99.99	35	100.00
1952-3												
A	10	18.52	1	8.33	4	11.43	6	11.11	0	0.00	4	10.81
B	11	20.37	5	41.67	6	17.14	17	31.48	8	42.11	5	13.51
C	19	35.19	3	25.00	7	20.00	16	29.63	8	42.11	18	48.65
D	7	12.96	1	8.33	3	8.57	7	12.96	3	15.79	5	13.51
F	7	12.96	2	16.67	15	42.86	8	14.81	0	0.00	5	13.51
Total	54	100.00	12	100.00	35	100.00	54	99.99	19	100.01	37	99.99
1953-4												
A	13	24.07	1	4.76	8	13.56	11	21.57	3	7.32	5	10.64
B	13	24.07	10	47.62	14	23.73	10	19.61	11	26.83	7	14.89
C	18	33.33	4	19.05	8	13.56	22	43.14	21	51.22	20	42.55
D	2	3.70	4	19.05	17	28.81	3	5.88	4	9.76	11	23.40
F	8	14.81	2	9.52	12	20.34	5	9.80	2	4.88	4	8.51
Total	54	99.98	21	100.00	59	100.00	51	100.00	41	100.01	47	99.99
1954-5												
A	10	15.63	4	22.22	4	6.06	9	14.06	5	21.74	8	13.79
B	16	25.00	5	27.78	23	34.85	12	18.75	5	21.74	12	20.69
C	18	28.12	7	38.89	18	27.27	31	48.44	13	56.45	31	53.45
D	9	14.06	1	5.55	5	7.58	5	7.81	0	0.00	4	6.90
F	11	17.19	1	5.55	16	24.24	7	10.94	0	0.00	3	5.17
Total	64	100.00	18	99.99	66	100.00	64	100.00	23	100.00	58	100.00
Totals 1950-1 through 1954-5												
A	48	17.08	8	6.96	30	12.61	34	11.81	9	5.81	22	10.00
B	69	24.56	34	29.57	58	24.37	61	21.18	32	20.65	39	17.73
C	88	31.32	33	28.70	45	18.91	127	44.10	82	52.90	99	45.00
D	32	11.39	18	15.65	43	18.07	32	11.11	22	14.19	30	13.64
F	44	15.66	22	19.13	62	26.05	34	11.81	10	6.45	30	13.64
Total	281	100.01	115	100.01	238	100.01	288	100.01	155	100.00	220	100.00

	Transfers* Fall and Spring Sems.		All Students		Transfers* Fall and Spring Sems.		All Students	
A	56	14.14	86	13.56	43	9.73	65	9.80
B	103	26.01	161	25.39	93	20.99	132	19.91
C	121	30.56	166	26.18	209	47.18	308	46.46
D	50	12.63	93	14.67	54	12.19	84	12.67
F	66	16.69	128	20.19	44	9.93	74	11.16
Total	396	100.01	634	99.99	443	101.00	663	100.00

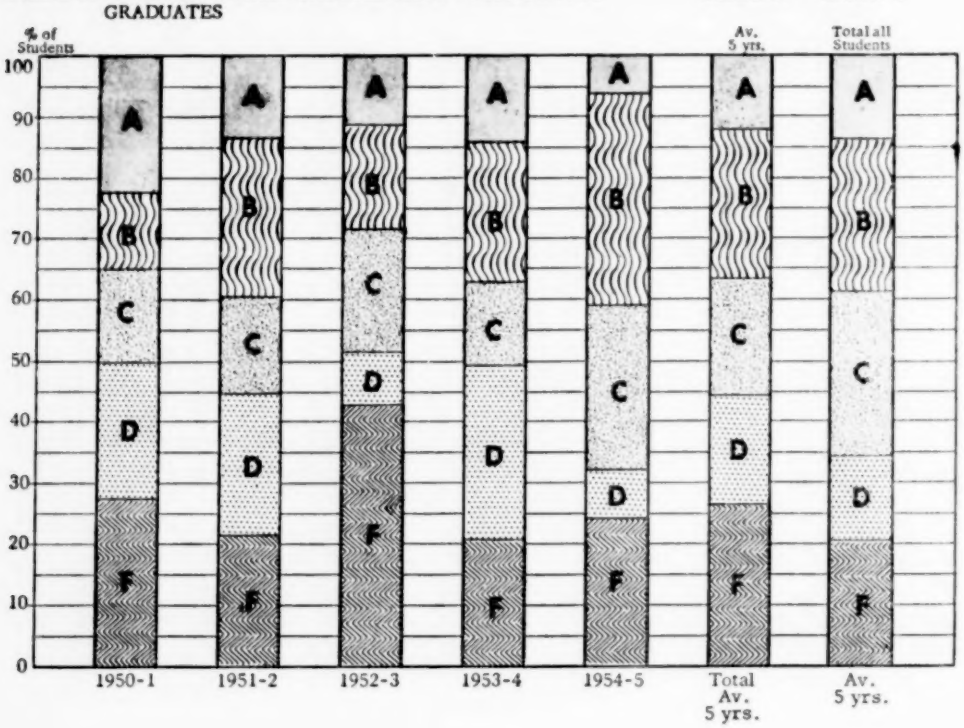
* "Transfers" refers to students transferring to the College of Pharmacy after one or more years of study at other institutions. Figures shown for both semesters include only transfer students taking the course for the first time.

** "High School Graduates" refers to students entering from high school.

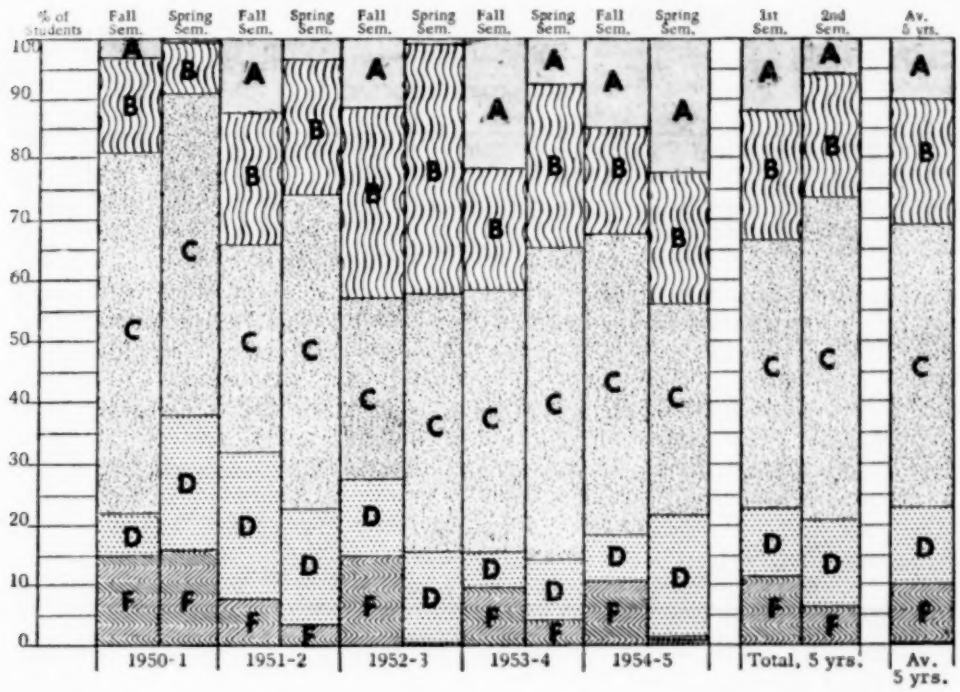
GRAPH I. PHARMACEUTICAL CALCULATIONS - TRANSFER STUDENTS. GRAPH III GRAPH IV



GRAPH II. PHARMACEUTICAL CALCULATIONS - HIGH SCHOOL GRADUATES GRAPH IV GRAPH V



GRAPH VI. INTRODUCTORY PHARMACY - TRANSFER STUDENTS GRAPH VIII GRAPH IX



GRAPH VII. INTRODUCTORY PHARMACY - HIGH SCHOOL GRADUATES. GRAPH IX GRAPH X

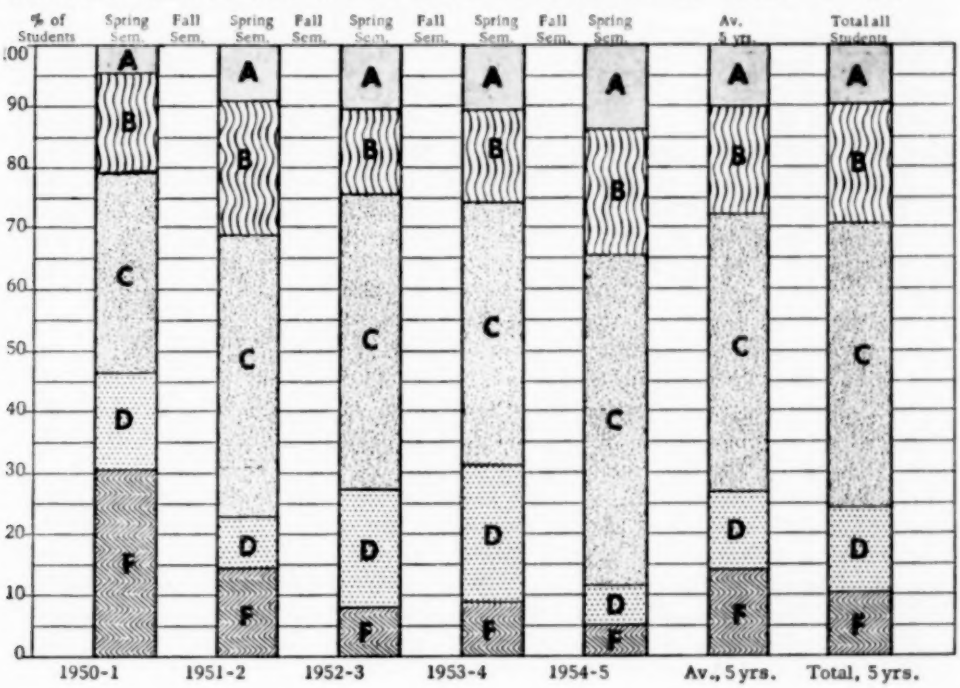


TABLE II

PERCENTAGES OF STUDENTS PASSING COURSE WITH GRADE OF A

$$\left(=\frac{\text{No. of As}}{\text{No. of As, Bs, Cs, Ds}}\right)$$

	Pharmaceutical Calculations			Introductory Pharmacy			
Fall Semesters	$\frac{48}{237} = 20.25\%$			$\frac{34}{254} = 13.39\%$			
Spring Semesters	$\frac{8}{93} = 8.60\%$	$\frac{30}{176} = 17.05\%$		$\frac{9}{145} = 6.21\%$	$\frac{22}{190} = 11.58\%$		
Fall and Spring Semesters	$\frac{56}{330} = 16.97\%$	$\frac{30}{176} = 17.00\%$		$\frac{43}{399} = 10.78\%$	$\frac{22}{190} = 11.58\%$		
All Students	$\frac{86}{506} = 17.05\%$			$\frac{65}{589} = 11.04\%$			

students with the exception of one year (1954-55). As in the case of pharmaceutical calculations one would expect the reverse to be true if the proper experience and training has been acquired to a desirable degree by the transfer student. However, the percentage of failures of the recent high school graduates appears to be consistently greater than that of the transfer students, indicating again that the previous college training was of some value in some of the theories and techniques. However, the advantage in favor of the transfer students is not sufficiently great to warrant a sound training in the fundamentals at junior and even some senior college levels.

It would appear from the report of the special committee of the Section of Teachers of Pharmacy relative to the course principles and processes of pharmacy that there is considerable difference of opinion as to the content of this course and whether it should be taught as a single course or integrated in other pharmaceutical subjects. As in the case of pharmaceutical calculations it would appear that a course besides that of pharmacy orientation presenting simple physico-chemical principles, which may or may not have been acquired by the student by the time he enters the college or school of pharmacy under the one-four plan, should be offered, and, if under the two-three plan, these principles should be integrated in the pharmacy course of the first professional year.

It is quite probable that with the great influx of students into our institutions of higher learning a serious overcrowding with inadequate staffs as to number and training may present some real problems as to what we might expect of the prepharmacy training of our students in the five year program. This condition alone might greatly delay the upgrading of the professional courses that should be accomplished if the five year program is to attain some of the objectives for which it was established.

NOTES AND COMMENTS

1. Figures shown in each instance are for students taking the courses for the first time.

2. The relatively high proportion of F grades among the high school graduates may be partly explained by the fact that during the period covered by these statistics no entrance examinations were required by The University of Texas; consequently, many high school students probably attended the University who were unable to do college work satisfactorily. The lower proportion of F marks for the transfer students indicates that this group did benefit somewhat from their previous college experience.

3. In order to find percentages of students with A grades on a basis which permits a more nearly fair comparison between transfer students and high school graduates, the percentages of students *passing the course* and who received A grades have been computed (Table II). The resulting percentages appear to indicate that the high school graduates (11.58 per cent) did almost as well as the transfer students taking the course in the fall semester (13.39 per cent) and considerably better than the transfer students taking the course in the spring semester (6.21 per cent). This would indicate that the transfer students were also receiving some additional worth-while basic training in the fundamental principles covered in introductory pharmacy—thus warranting a possible sound argument for requiring the course of all students. Furthermore it is quite likely that with the great influx of students expected in the years to follow with high student-teacher ratios and crowded facilities the situation will not be alleviated by students in the prepharmacy period of the five year program.

4. The interesting fact illustrated by the figures is that the transfer students taking the course in the spring semesters made relatively fewer A grades, although there is evidence that this effect is tending to disappear. For the last two years of the five year period covered by these figures, the spring semester transfer students have made larger percentages of A grades in introductory pharmacy; and for 1954-55 they have made a larger percentage of A grades in pharmaceutical calculations. This showing on the part of transfer students in the spring semester might be explained as follows:

> (a) The transfer students entering in the spring semester are likely to be persons who have failed in some courses in high school or junior college and are, therefore, not the best type of students. Or they may have entered the University with deficiencies, which had to be removed before entering the course and are less likely to make A grades than other students.
>
> (b) Also, a majority of the students entering the spring semester were veterans or others that had been out of the college or university for various periods of time.

CONCLUSION

It therefore seems highly desirable for colleges or schools of pharmacy to consider seriously the one-four plan of study including in the first professional year an orientation course and pharmaceutical calculations during the fall semester and/or pharmaceutical calculations and a course dealing with

fundamental physico-chemical principles possibly taught at a higher level than in the four year program as a further aid in screening students at the second professional year in the program. This basic training should be highly helpful to transfer students in light of increased enrollments in all junior and senior colleges with possibly inadequate staffs and facilities. The one-four program is to be recommended since organic chemistry as an important basic course could be offered in the first professional year, for which the transfer student could obtain credit if a satisfactory grade were made by him on a suitable placement test.

Like Isaiah, they already see the world in ruins before it is ruined, but unlike Isaiah they seem to offer no remedy against the day of ruin; sometimes one might suspect that they enjoy their role as prophets of evil and that they would not wish to see the ruin prevented.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 245 (1937)

THE CANADIAN CONFERENCE OF PHARMACEUTICAL FACULTIES*

G. R. PATERSON

INTRODUCTION

The Canadian Conference of Pharmaceutical Faculties has been in existence little more than a decade, but has already done much to raise the standards of pharmacy across Canada. The need for coordination of principles and methods of pharmaceutical education in the various provinces of Canada had been apparent almost forty years before in 1907, to the founders of the Canadian Pharmaceutical Association. One of the committees authorized by the initial bylaws of the Association was the Committee on Pharmaceutical Education "who shall consider the educational requirements of the different provinces and note their relation to the commercial and professional welfare as well as public usefulness of the profession. This Committee may also consider the adoption of a uniform standard for the Board of Examinations in pharmacy throughout Canada" (1).

During the next thirty-five years, the Association frequently discussed the desirability of convening meetings of representatives of the various pharmaceutical teaching institutions (2). A committee was appointed in 1923 to arrange such a meeting, and in his presidential address in 1925, J. B. D. F. MacKenzie urged that an annual meeting of faculty representatives be held at the time and place of the Association's conventions (3). The low membership fees then charged by the Canadian Pharmaceutical Association and the consequent lack of funds prevented realization of these several proposals.

The first conference of pharmaceutical educators for discussion of mutual problems was convened at the University of Manitoba in Winnipeg, June 30, 1917 (4). Those attending the conference were Professor H. H. Gaetz, Director of the Course in Pharmacy at the University of Alberta, Dean Alexander Campbell of the University of Saskatchewan, and Henry E. Bletcher, Professor of Pharmacy at the University of Manitoba. Teaching in pharmacy in Manitoba had been established in 1884 by the Manitoba College of Pharmacy, and when the University of Manitoba assumed responsibility for instruction in pharmacy in 1914, it instituted the first two year course in Canada (5). The other two schools represented at this first conference were in their formative stages and benefited much from the experience of the older school. At the subsequent conferences in Edmonton, Alberta, in 1918, Winnipeg in 1920, and Saskatoon, Saskatchewan, in 1921, "The main purpose was to reach a general agreement on the subjects taught, so that ultimately the courses of the three universities would be educationally equivalent but not necessarily identical except approximately so in the purely professional subjects, near equivalence in the subjects being necessary for reciprocal registration the ultimate goal" (4). Discontinuance of the meetings was due to the ill health of Professor Gaetz who died in 1922.

A "Conference of Faculties" was held at Kingston, Ontario, in 1937 at the combined meeting of the Canadian Pharmaceutical Association and the Ontario Retail Druggists Association (6). Dean E. L. Woods of the Uni-

* Presented to the American Institute of the History of Pharmacy, Detroit, Michigan, 1956.

versity of Saskatchewan, Dean R. O. Hurst of the Ontario College of Pharmacy, and Dean G. A. Burbidge of the Maritime College of Pharmacy, Halifax, Nova Scotia, attended, the latter serving as chairman. Subjects of discussion included the limitation of apprentices and graduates in pharmacy, the advantages of uniform entrance requirements to pharmacy, the free exchange of methods of teaching, and the possibility of classifying retail pharmacies for purposes of training apprentices. This conference did not survive for a second meeting. Thinking in all branches of Canadian pharmacy was still provincial, not national.

C.PH.A. INTEREST IN PHARMACEUTICAL EDUCATION

In the first thirty-five years of its existence, the Canadian Pharmaceutical Association was for the most part concerned with the problems of the retail pharmacist. It lacked the financial resources to arrange full meetings of its council and became an organization dominated by Central Canada and devoted primarily to commercial aspects of pharmacy. Before the Association could become truly representative of all branches of pharmacy in Canada, it required financial stability.

That much greater financial support was available from the retail pharmacists became apparent late in 1942 and in 1943 when many of them subscribed voluntarily to a fund designed to aid the newly formed Board of Commercial Interests, a committee of the Canadian Pharmaceutical Association, to deal with their commercial problems. Changes in the bylaws were necessary to permit this new body to operate.

In suggesting necessary changes in the bylaws, J. W. Preston (7), Acting Chairman of the Council of the Canadian Pharmaceutical Association, noted that many of them were out of date. Among the new clauses he suggested was the following, "College Faculties: Make provision for meetings of members of college faculties at Annual Meeting as soon as funds are available." At the August, 1943, meeting of the Council, the reorganization of the Canadian Pharmaceutical Association became fact, and the greater financial security accomplished by means of an increased levy on a per capita basis on the constituent provincial statutory bodies made possible a great increase in the influence in all branches of pharmacy on the part of the Association (8).

Late in 1943, M. J. Warner, of Edmonton, Alberta, President of the Canadian Pharmaceutical Association, wrote (9) that the representatives of the various provincial pharmaceutical associations, who in their respective councils had in the past controlled educational matters for the most part, need "the advice of those men who are particularly in the educational field and best situated to keep in step with the advancing trends in pharmacy and can best make suggestions for the advancement of the profession." Matters of concern in post war rehabilitation and training which he felt needed serious consideration included entrance requirements, apprenticeship, curricular standardization across Canada, a Dominion examining board, interprovincial reciprocity and facilities for advanced training. F. N. Hughes, then Associate Professor of Materia Medica and Pharmaceutical Chemistry of the Ontario College of Pharmacy, wrote in the *Canadian Pharmaceutical Journal* later in 1943 (10) of the need for increasing standards and obtaining uniformity of these standards in Canadian schools of pharmacy.

At the executive meeting of the Council of the Association in Toronto in January, 1944, "it was stated that many of the ills of Pharmacy today come from the lack of education, or rather the lack of coordination among the pharmacy teaching staffs in the country" (11). The Executive recommended formation of an Educational Committee be considered by the whole Council in August and that steps be taken meanwhile towards setting such a committee in motion. In May, 1944, President Warner wrote, "It is hoped that a meeting of an educational committee will be held during the Council meeting in August. If pharmacy is to hold its position as a profession, we must keep abreast of the times in the field of education and periodic meetings of the heads of the various faculties of pharmacy is desirable for the exchange of experiences and the formulation of and improvement of curricula" (12). J. W. Preston, the Secretary of the Association, was able to announce in the same issue of the *Canadian Pharmaceutical Journal* (13) that all the Canadian deans of pharmacy would meet in August. In a survey of deans of pharmacy reported in the same issue (14), there was wholehearted agreement on the desirability of such a meeting and unanimous forecasts concerning what could be accomplished for Canadian pharmacy.

THE ORGANIZATIONAL MEETING OF THE CCPF

Five of the seven Canadian schools of pharmacy then in existence were represented by their academic heads and a sixth by one of its trustees, at Toronto, August 14-16, 1944. In addition the Province of British Columbia, where serious consideration was being given to the establishment of a school within the provincial University, was represented by a lay delegate. The delegates were welcomed on behalf of the Canadian Pharmaceutical Association by V. E. Hessell, Executive Manager of the Board of Commercial Interests who stated in part, "There is a great responsibility before us today if we are going to guide pharmacy wisely under present-day rapidly-changing conditions. There is a mounting tide of opinion that if pharmacy is to maintain its rightful position of prestige in our present society that almost revolutionary steps are indicated" (15). Dean E. L. Woods of the University of Saskatchewan was elected Chairman and Professor F. N. Hughes of the Ontario College of Pharmacy, Secretary of the educational conference. The various delegates had previously been asked to be ready to introduce discussion of the different subjects of the agenda.

Dr. A. W. Matthews of the University of Alberta began discussion of the objectives and organization, stating that he felt objectives could be divided as "immediate" and "long-range." The former he set out as, "(a) the apprenticeship requirement, (b) problems arising out of rehabilitation and post-war reconstruction, (c) cooperation of the colleges of pharmacy in the C.Ph.A. public relations and development program, (d) Canadian Formulary revision" (16). He felt that the Canadian Pharmaceutical Association was looking for definite policies and perhaps resolutions from the meeting of educators on these subjects. He proposed as long-range objectives "(a) selection of students and providing scholarships for students in need of assistance, (b) minimum standards for the college requirements (length of course, minimum syllabus, texts, etc.), (c) organization of graduate study in pharmacy in Canada, (d) participation of the colleges in a program of

pharmaceutical research, (e) extension programs for retail and hospital pharmacists, (f) collaboration of allied drug industries in a program for improving facilities for pharmaceutical education."

Discussion concerning the type of permanent organization to result from the first conference was crystallized in this resolution: "Whereas it is the unanimous opinion of the delegates here assembled that in order to insure continuous promotion and advancement of pharmaceutical education in Canada, be it resolved (i) that we recommend to the Council of the C.Ph.A. that they establish a permanent organization for this purpose; (ii) that the name of the organization be, 'The Canadian Conference of Pharmaceutical Faculties;' (iii) that the objectives of the Conference shall be in general to promote the advancement of pharmaceutical education in Canada and to encourage the development of uniform education standards through the meeting and interchange of ideas between members of faculties; (iv) that the Conference shall be composed of the faculties of the following institutions: The Maritime College of Pharmacy, Department of Pharmacy of Laval University, the Faculty of Pharmacy of the University of Montreal, and the Ontario College of Pharmacy, the Department of Pharmacy and Pharmaceutical Chemistry of the University of Manitoba, the College of Pharmacy of the University of Saskatchewan, the School of Pharmacy of the University of Alberta, and in addition, one delegate designated by the Council of the Pharmaceutical Association of British Columbia until such time as a Faculty of Pharmacy be established at the University of British Columbia; (v) that it should be recorded as necessary that there be an annual meeting of at least one official representative from each of the above-mentioned faculties and associations, to be held concurrently with the annual meeting of the Council of the C.Ph.A."

Other recommendations adopted by the Conference for transmission to the Council of the C.Ph.A. included, "That present apprenticeship requirements be replaced by a total of eighteen months of practical experience in a retail pharmacy, to be obtained before, during and/or after the college course, preferably during and after": "That the course at college should be a minimum of three full academic years after Senior Matriculation for the B.Sc. degree and the license to practice retail pharmacy, but a minimum of four full academic years to prepare for graduate study or the specialized fields such as manufacturing, hospital, etc."; "That a Foundation be established and administered by representatives of the C.Ph.A., the Conference of Pharmaceutical Faculties and the Council of the Allied Drug Industries, the chief functions of the joint group being to receive and administer funds to encourage and promote pharmaceutical research." The last resolution fell on fertile ground for the time was ripe for the formation of the Canadian Foundation for the Advancement of Pharmacy (CFAP) (17).

Permanence was given to the Conference by election of Dean Woods as Chairman and Professor Hughes as Secretary for the ensuing year and by the appointment of standing committees on Constitution and Bylaws: Extension, Rehabilitation and Public Relations; Curriculum and Canadian Textbooks; Student Selection, Graduate Study and Pharmaceutical Research, and by nomination of two of its members to the Canadian Formulary Committee of the C.Ph.A.

The influence of the newly organized Conference was readily apparent in the next year when many of the constituent faculties were able to report progress on their part and on the part of the provincial statutory bodies in implementing recommendations relative to length of course for licensing requirements and apprenticeship.

In the 1945 meeting, the report of the Committee on Constitution and Bylaws (18) was presented in the form of a proposed constitution and bylaws, which envisaged the Conference as a branch of the Canadian Pharmaceutical Association, functioning within the framework of the parent organization. The Council of the Canadian Pharmaceutical Association informed the Conference that while it desired the uninterrupted continuance of the Conference's work, it was not in a position financially to commit the Association to annual meetings of the Conference after 1946 (19). The Council suggested that the newly formed Canadian Foundation for the Advancement of Pharmacy might be able to contribute some support to the Conference. The latter body postponed decision on Constitution and Bylaws until alternate forms of organization and methods of organization could be studied.

The 1946 report of the Executive Committee on the future status of the Conference (20) suggested three possibilities of organization (a) separate organization in which the Conference would be responsible only to the constituent faculties which would be paying all expenses, (b) an organization supported partially by the C.Ph.A. and partially by the constituent faculties, and (c) an organization closely associated with the C.Ph.A., constituted along the lines proposed in the Constitution and Bylaws as presented at the 1945 meeting. The view of the Conference as transmitted to the Council of the C.Ph.A. was that the third possibility was the one that would yield the greatest benefit to pharmacy in general. The Council then approved the establishment of the Canadian Conference of Pharmaceutical Faculties as a permanent organization within the framework of the C.Ph.A., which would finance annual meetings of the Conference up to an amount of $1,500.00. The exact constitutional relationship of the CCPF and the C.Ph.A. remained to be worked out by the two Executives (21).

In the Constitution and Bylaws of the Canadian Conference of Pharmaceutical Faculties (22), adopted August, 1947, the Conference was defined as a "voluntary organization of Canadian Faculties of Pharmacy and shall work in conjunction with the Canadian Pharmaceutical Association." The relationship was defined in a later clause as follows, "An annual report of all business of the Conference shall be submitted to the Council of the Canadian Pharmaceutical Association during the annual meeting of the Council; and the minutes and records of the Conference shall be open to inspection on the authority of the President of the Canadian Pharmaceutical Association at any time." The general objects of the Conference were approved as, "(a) to promote pharmaceutical education and research, (b) to provide opportunity for interchange of ideas and discussion of curricula and teaching methods with a view to their continual improvement, (c) to encourage high and uniform educational standards in pharmacy throughout Canada and (d) to make recommendations to the Council of the Canadian Pharmaceutical Association regarding educational policies and the advancement of the science and practice of pharmacy."

In 1950, the Canadian Foundation for the Advancement of Pharmacy agreed to pay 50 per cent of the cost of the Conference of Pharmaceutical Faculties, not to exceed $1,000 yearly, for the years 1950 and 1951 (23). The following year, the arrangement was extended indefinitely, thus ensuring the future financially for the Conference (24). The Conference is now financed jointly by the Foundation and the Canadian Pharmaceutical Association, the contribution of neither to exceed $1,000 per year.

ACCOMPLISHMENTS OF THE CANADIAN CONFERENCE OF PHARMACEUTICAL FACULTIES

Educational Standards. In the organizational meeting of the Conference in 1944, the following resolution concerning length of course and requirement for licensing was adopted unanimously, "College Courses. Whereas, it is desirable to obtain more uniform and higher academic standards in pharmaceutical education across Canada, be it resolved, therefore, that in the opinion of the Conference: (1) a minimum college course of three full academic years beyond senior matriculation, leading to the degree of B.Sc. in Pharmacy, should be required to qualify for the license to practice retail pharmacy, (2) for specialization in any of the related fields or for preparation for graduate study, a minimum college course of four full academic years beyond senior matriculation should be required, (3) consideration should be given, as early as possible, to the requirement of a four year course of study beyond senior matriculation for the license to practice retail pharmacy" (25). The details of the minimum three year curriculum were finally approved in 1950, all schools reporting they were "in essential conformity with the approved standards." Current study of the committee concerns a four year curriculum after senior matriculation (grade XII in some provinces, grade XIII in others).

Conference Publications. The Proceedings of the Conference have been made available every year in mimeographed form. They represent a most complete record of the accomplishments of the Conference in the twelve years of its existence.

After the 1946 meeting of the Conference, the Editor of the *Canadian Pharmaceutical Journal* "enquired concerning the possibility of inaugurating a Conference Section in the *Journal* consisting of one article each month to be written by a member of the Conference" (26). The first Conference article appeared November 15, 1946. Some articles in the series, which has continued to the present, have been original research reports, some have been reports of Canadian formulary revision investigations, and most have been of a review nature designed especially for the practicing pharmacist. Various members of the Conference have served as Editor of this Conference Section.

In January, 1948 (27), a new publication the *Bulletin of the Canadian Conference of Pharmaceutical Faculties* was begun in a small way to gauge the need for a continuous means of communication for Conference members between annual meetings. The response was immediate, and the *Bulletin* soon became a monthly publication. It has been edited since then by various members of the Conference.

The Conference hopes to initiate a scientific journal or section of an existing journal when the volume of pharmaceutical research in Canada shall warrant it.

Canadian Formulary. At the first meeting of the Conference in 1944, the subject of *Canadian Formulary* revision was reviewed and discussed (28), and early in 1945, the Secretary of the Canadian Pharmaceutical Association, J. W. Preston, asked that the Conference undertake revision of the *Canadian Formulary* (29). Committees and subcommittees were appoitned, Dr. A. W. Matthews was named editor, and the present edition of the Canadian Formulary appeared in 1949.

Apprenticeship. As has been noted, in its first meeting the Conference expressed the view that apprenticeship had largely lost its original significance and value due to changing conditions and resolved that apprenticeship aims should be capable of fulfillment in eighteen months. Many of the delegates at the next meeting were able to report that their provincial statutory bodies had reduced the length of apprenticeship appreciably. Of real interest was the "Report of a Study on the Value of Apprenticeship Training," presented to the 1950 meeting by Professor R. Larose of the University of Montreal. Study now is concerned with the relative values to be gained from precollege and postcollege training.

Teachers' and Research Conferences. One of the features of nearly every Conference meeting has been the exchange of ideas on course content, teaching methods, etc. in the Teachers' Conference. Such views are also exchanged by means of the *Bulletin*. Research conferences for the presentation of original reports have been held less frequently, but it is hoped they will become an annual feature.

Civil Defense. Largely through the work of Dean W. C. MacAulay of the University of Saskatchewan, civil defense has become a thoroughly discussed topic at Conference meetings. As a result, the Conference in 1955 approved the motion "that this Conference accept the responsibility of initiating a course of indoctrination in the role of the pharmacist in civil defense in the eight faculties of Pharmacy in Canada" (30).

Vocational Guidance. Of prime interest to the Conference and its members has been selection of students for the profession. Perhaps the greatest accomplishment in this field was the aid given by the Canadian Foundation for the Advancement of Pharmacy in producing the vocational guidance film-strip "Pharmacy as a Career."

Representation on C.Ph.A. Council. The Conference, a product itself of concern on the part of the Canadian Pharmaceutical Association that it be more representative of all Canadian Pharmacy, has in the past few years taken an important role in the broadening of the Association still more. When the Association adopted the "Hughes Report" in principle in 1953, and a special committee in 1954 presented a report concerning the method of implementation, the Conference and the Canadian Society of Hospital Pharmacists were assured a stronger voice in the affairs of all Canadian pharmacists. Now each appoints a member to the Council of the Association, and their representatives alternate as members of the Executive. This most interesting phase of the history of Canadian pharmacy is discussed in a paper "The Canadian Pharmaceutical Association" presented to the Section of the History of Pharmacy in Detroit in April, 1956 (31).

Canadian - American Relations in Pharmaceutical Education. It seems appropriate to close this story of the Canadian Conference of Pharmaceutical Faculties by noting its relations with its American equivalent, the American Association of Colleges of Pharmacy. Through the years, most of our Canadian schools have benefited greatly from exchanges of ideas with individual American schools and by attendance of various members of their teaching staffs at the Teacher's Seminars in the United States. Early in 1955, the Secretary of the American Association of Colleges of Pharmacy, Dr. R. A. Deno, requested from the Chairman of the Conference, "an expression of opinion on the merits of a suggestion made at the interim meeting of the Executive Committee of the AACP regarding the extension of membership to include Canadian colleges of pharmacy" (32). After a discussion replete with many references to the desirability of even closer relations, the following motion was adopted "that the Conference convey to the Secretary of the AACP the favorable opinion the Conference has respecting a closer relationship of the two groups and that the Chairman of the Conference appoint a committee of three to act in liaison with the committee of the AACP in order to work out conditions" (33). Meetings of the committees of the two organizations are now taking place. Of the many accomplishments of the Conference since its inception in 1944, not the least in importance is the establishment and extension of close relations with the American Association of Colleges of Pharmacy and the other pharmaceutical organizations of the United States.

REFERENCES

(1) Gibbard, G. E., Editor, *Can. Pharm. J.*, 41, 74 (1907).
(2) Historical Note, *Proc. Can. Conf. Pharm. Fac.* (1944).
(3) MacKenzie, J. B. D. F., *Can. Pharm. J.*, 59, 11 (1925).
(4) Bletcher, H. E., *Proc. Can. Conf. Pharm. Fac.* (1944).
(5) McDougall, D., *Ibid.*, 9 (1945).
(6) Hurst, R. O., *Ibid.*, 9 (1947).
(7) Preston, J. W., *Can. Pharm. J.*, 76, 274 (1943).
(8) Preston, J. W., *Ibid.*, 76, 502 (1943).
(9) Warner, M. J., *Ibid.*, 76, 752 (1943).
(10) Hughes, F. N., *Ibid.*, 790 (1943).
(11) Editorial Report, *Ibid.*, 77, 75 (1944).
(12) Warner, M. J., *Ibid.*, 77, 351 (1944).
(13) Preston, J. W., *Ibid.*, 77, 353 (1944).
(14) Matthews, A. W., E. L. Woods, D. McDougall, R. O. Hurst, and J. A. Marquis, *Ibid.*, 77, 364 (1944).
(15) Hessell, V. E., *Proc. Can. Conf. Pharm. Fac.* 2 (1944).
(16) Matthews, A. W., *Ibid.*, 11 (1944).
(17) Hughes, F. N., *Can. Pharm. J.*, 77, 626 (1944).
(18) Report of Committee on Constitution and Bylaws, *Proc. Can. Conf. Pharm. Fac.*, 26 (1945).
(19) Hughes, F. N., Editor, *Ibid.*, 65 (1945).
(20) Woods, E. L., *Ibid.*, 18 (1946).
(21) Hughes, F. N., Editor, *Ibid.*, 46 (1946).
(22) *Ibid.*, 74 (1947).

(23) *Ibid.*, 16 (1950).
(24) Murray, D. H., Editor, *Ibid.*, 24 (1951).
(25) Walker, G. C., Editor, *Ibid.*, 30 (1955).
(26) Hughes, F. N., Editor, *Ibid.*, 14 (1947).
(27) *Ibid.*, 12 (1948).
(28) Hurst, R. O., *Ibid.*, 45 (1944).
(29) Hughes, F. N., Editor, *Ibid.*, 40 (1945).
(30) Walker, G. C., Editor, *Ibid.*, 72 (1955).
(31) Paterson, G. R. and Moisley, P. T., *J. A. Ph.A. Pract. Ed.*, 18, 481 (1957).
(32) Walker, G. C., Editor, *Proc. Can. Conf. Pharm. Fac.*, 12 (1955).

In those simpler days, the world had some understanding of the areas within which an educated man would be expected to move with relative confidence and familiarity.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 247 (1937)

HOW CAN WE TRAIN FOR INDUSTRY?

ROBERT V. EVANSON

Pharmaceutical education at the university level is in itself an example of the dynamic nature of the whole industry labeled as pharmacy. The first education was apprenticeship under men who operated retail pharmacies and taught the subject matter of crude drugs and compounding. As pharmacy progressed, full-time professional pharmacy teachers assumed instructional duties which increased in number and duration from a few to many courses, from one to four years (and soon to five years), and from no degree to one which is equivalent to any scientific degree offered at any academic level to which the student aspires.

There has also been concurrent progress in the subject matter of pharmaceutical education. Contrary to many opinions, the material of fifty years ago is not being taught today except for that which is of historical or evolutionary value to current knowledge requirements. Much criticism can be made relative to certain courses which seem never to change: however, it is irresponsible criticism unless it represents a critical review of course content and objectives. Education—along with the practice of the profession —has progressed from the crude drug and pill era to the mycin and tablet-within-a-tablet era.

Perhaps it is of value to note here that, in addition to perpetuating a supply of practitioners, education has also met the challenge of perpetuating itself through the development of graduate programs designed to train teachers. These same graduate programs have added to progress by also training men for industrial careers in production, control, and research.

We are now living in a period of time which can be given many titles, three of which are most important to this discussion: namely, the era of super research, the era of marketing, and the era of professional management. Advanced pharmaceutical training for industrial pharmacy has been oriented toward the production and research functions for many years and needs no particular stimulation to adapt itself to the present supersonic research era of finding new products, new methods, or new uses for old products and methods.

From the preceding remarks it seems reasonable to assume that pharmaceutical education can be equal to the challenge offered by marketing and management. Pharmacy schools have added both special courses and personnel to direct students in a study of the principles and practices of business as applied to pharmacy: however, these courses are mainly undergraduate and are aimed toward the retail operation. There still remains the challenge of training pharmacists for marketing and management as practiced in wholesale and industrial operations, as well as providing more teachers who can direct such academic programs at both undergraduate and graduate levels of study.

How can we train students for the pharmaceutical industry: or perhaps the question might be phrased, how should we train for industry? To answer this question we must know the type of products to be produced, the contemplated uses of the product, and the best methods of producing it. If we can assume that the needs of manufacturing, control and research,

per se, are being satisfied, the product becomes a man trained in management, marketing, and general business acumen: namely, a man trained in the subject matter of pharmacy administration.

The type of products will depend upon individual objectives relative to the needs of industry, but every student majoring in this subject matter will have as a general goal a position in some phase of the professional managerial class that has developed in recent years. Such a person is described by W. D. Patterson, Associate Publisher of *The Saturday Review*:

> Business has found that the executive with a broad general grounding in the humanities and liberal arts, reinforced by professional training in the special problems of management, holds greatest promise for becoming the creative, sensitively oriented man required to conduct affairs today at the top level of U.S. industry (1).

This description plus an added professional training in pharmacy depicts the desired product.

The uses to which this product may be put are many. Specific training may limit the use, and/or predetermined uses may affect or determine the training. A pharmacist with advanced study in management, marketing, finance, and economics can be adapted to his environment: however, it is quite reasonable to assume that the majority of nonteaching majors in pharmacy administration will select positions in the several marketing functions.

The best methods of producing the product are both debatable and personal. The essence of any good training is an understanding of the descriptive material relative to a given subject and of the fundamental principles and practices relative to the total subject matter. Business education has been built upon the descriptive method wherein a specialist teaches finance, accounting, marketing, or management as a self-contained course consisting of principles, factors, and memorizable points. However, this precludes a necessity for experience as an aid to understanding.

Business training—like pharmacy training—should provide as much "do" as "remember." A pharmacist takes much of the descriptive material to the laboratory to prove that it works or that he can do the job as stated in the text. Likewise, administrative training has entered the case problem era wherein actual problems are written to cover a multitude of management and marketing skills and knowledge with the objective of forcing the student to make some type of decision. Thus a working knowledge of the descriptive material is combined with the circumstances of known situations to provide a positive thought experience based upon facts.

A normal sequence of study for a year of marketing, for example, may be considered as one semester of descriptive material followed by one semester of case studies. Although this is quite acceptable, pharmacy administration lends well to the combination method of integrating both case and descriptive material over the same one-year period so that the student is subjected to the facts of the situation and all of the necessary descriptive material relative to solving the case by rendering a decision. In this manner the student can be directed into situations which are pharmaceutical problems and only those general problems which also apply to pharmaceutical needs.

There is another basic philosophy which must be predetermined by the teacher: what will be his major educational objective in the development of a program or method of instruction? A sound philosophy of training was

presented to the Secondary Education Board Conference in New York by Wilfred D. Gillen, President of the Bell Telephone Co. of Pennsylvania.

> I believe colleges and universities could turn out a person better equipped to assume greater responsibilities faster if they left to business a greater part of the specialized training.
>
> I think what business needs from our colleges and universities are men and women with a sound foundation on which detailed instruction on the job can be built—that greater emphasis be given to the theory of mathematics or physics or chemistry or economics rather than to its application—that students be taught 'what' and 'why' rather than 'how'. The industry with which the graduate becomes associated will have the job anyway of providing the specialized knowledge (*2*).

Such a philosophy is no less valuable for students in pharmacy even though they are rather certain of an association with some phase of the pharmaceutical industry. This specific industry offers many and varied opportunities in which on-the-job training is best built upon an education of "what" and "why" rather than "how."

Still another facet of a training program is delineated by Crawford H. Greenewalt, President, E. I. duPont de Nemours and Company in a discussion of the Culture of the Businessman.

> Despite our mass attendance at college and our mass exposure to culture, education remains an individual achievement. I am afraid the emphasis, in education as elsewhere, has been in recent years on the group, with the tendency to obscure the star in the constellation, the soloist in the ensemble. Yet it will always be true, I am sure, that the individual will provide the basis for progress (3).

The general trend today is mass education at all levels up to the B.S. and B.A. degrees. This trend also extends to the M.S. and M.A. degrees in some areas. Such a great emphasis has been placed upon business and economics that many schools, in addition to advancing their own graduates, accept large numbers of nonbusiness students from professional schools with only minimum requirements. Here again the graduate student can become involved in a group. The group is somewhat smaller, but the instruction is still based upon mass techniques. Therefore, it seems desirable to educate pharmacists beyond the bachelor level in schools of pharmacy in pharmacy administration—as well as in the other pharmaceutical sciences—because of the individual attention possible with a small group of students. In this way all of the student's college and learning experience can be associated directly with the situations and structures of the pharmaceutical industry.

Specifically, what should be available in a program to train for industry? Since all industry operates within the framework of the economy and monetary structure, courses relative to financial management and financial control, economics for management, money and banking, and monetary theory should be available. Courses designed to provide competence in industrial management, business organization, and employee, trade, and public relations are most important. Courses relative to marketing in general, marketing management, pharmaceutical marketing, and market research should be available. As many of these marketing courses as possible should be offered in the department of pharmacy administration in order that the material can be selective and pointed toward pharmaceutical needs.

How can we train for industry? More specifically, how can we train for industry through pharmacy administration? This special discipline can be of major service to the pharmaceutical industry by organizing the training of graduates who wish to apply an undergraduate pharmacy knowledge to an advanced major study in management and marketing, or who wish to apply some minor understanding of marketing and/or management to advanced major study in the scientific areas.

Through proper scheduling and curriculum formation the finished product can be one familiar with the humanities, liberal arts, and social sciences to a limited degree in addition to a thorough knowledge of the art and science of pharmacy. To these can be added the advanced studies in marketing, management, economics, pharmacy, pharmaceutical chemistry, or other social, physical, or chemical studies in such portions as will provide the type of graduate product necessary to meet the personal objectives of the student and the specific needs of industry.

Through interdepartmental cooperation and intradepartmental personnel the product can be developed in an integrated program which includes the teaching of both descriptive and case material emphasizing the fundamental principles and workable theories to provide a sound foundation for future on-the-job application. Because of the inadequacies inherent in mass education techniques for personal development, the training of pharmacists in the subject matter of pharmacy administration can be controlled to a greater degree of satisfaction by the school of pharmacy. Further, a larger part of the major work can be offered as a part of the pharmacy (administration) curriculum under the direct supervision of the pharmacy faculty, much the same as occurs in the other four pharmacy departments.

Real progress is oftentimes slow; however, it is nonetheless certain. A recent report on graduate study for 1957-58 by the American Association of Colleges of Pharmacy indicates that eighteen colleges of pharmacy will have available programs of advanced instruction in pharmacy administration to the Master of Science level, and eight of these colleges also list the Ph.D. degree. Only nine of these colleges state that their programs are controlled or supervised by the school of pharmacy, including four of the Ph.D. programs (4). From these can be seen the beginning of pharmaceutical education's acceptance of the challenge to train for industry, wholesaling, retailing, and education in pharmacy administration to meet the demands of the new eras of marketing and management.

REFERENCES

(1) Patterson, W. D., *Sat. Rev.* 40 (3), 28 (1957).
(2) Gillen, Wilfred D., *Newsweek* 49 (11), 122 (1957).
(3) Greenewalt, Crawford H., *Sat. Rev.* 40 (3), 13 (1957).
(4) Deno, Richard A., *Am. J. Pharm. Ed.*, 21, 43 (1957).

What pharmacy most needs is a lot of creative thinking and no one has a copyright on that mode of thought.

Rufus A. Lyman, Am. J. Pharm. Ed., 5, 227 (1941)

THE DEVELOPMENT OF PHARMACY IN POLAND

WITOLD SASKI

By taking her religion (A.D. 966) and culture from the West, Poland joined the family of Western countries and has remained since within the sphere of influence of Western civilization. In 1006 King Boleslaw the Valiant invited to Poland the first monks, Benedictines and Cistertians, who grew South European vegetables and spices as well as medicinal plants utilized in their monastic dispensaries. The popularization of the cultivation of these plants and spices, by means of distribution and advice on proper procedures, goes to their credit. In such a way sage, mint, thyme, marshmallow, anise, fennel, parsley, and cucumber became known in Poland (1).

The oldest public pharmacies were in existence in the province of Silesia in the thirteenth century. A record available mentions such a pharmacy operated in the town of Swidnica in 1248 (2). In the annals of the old Polish towns in other provinces we find evidence that very early in the fourteenth century there were apothecaries there. They, as well as representatives of many other professions and trades, came from the foreign countries: Germany, France, and Italy. Some influence on the development of pharmacy in their adopted country was also exerted by the king's apothecaries. Princess Bona Sforza, wife of King Siegmund the Aged, when coming from Italy to Poland in 1518, brought a number of court officials with her. Among them was an apothecary, Giovanni Alantse. Ever after, there were apothecaries at the royal court.

The first state control over pharmaceutical service was introduced by a law passed by the "Coronation Parliament" at Piotrkow in 1633. By virtue of this law no one was allowed to run an apothecary shop unless he had passed the qualifying examination and received a certificate from the Medical Faculty of the University of Cracow. This first university in Poland, the second oldest university in Central Europe, was founded by King Casimir the Great in 1364. In this university, reorganized by King Wladyslaw Jagiello in 1400, the chair of botany and materia medica was created in 1589. Professor Simon Syrenski vel Sirennius was the author of the first important book on medicinal plants written in Polish, *Zielnik* (Herbarium), 1,540 pages in folio, published in Cracow in 1613. Another remarkable book on vegetable drugs *Herbarz* (Herbarium) was written, also in Polish, by Martin of Urzendow in 1595 (1).

The first pharmacopeias in Poland, as in other European countries, were municipal dispensatories. They originated in the seventeenth century. The oldest one was written by Dr. Ernest Scheffler and Dr. Jan Schmidt on recommendation of the City Council of Gdansk (Danzig) under the title *Dispensatorium Gedanense* in 1662. The second municipal dispensatory was *Pharmacopoeia Cracoviensis* written, also in Latin by Dr. Jan Woyna, senior physician to the King, and published at Frankfurt am Main in 1683 (3).

Cracow University took the lead in the battle with scholasticism which was growing old in the West, and introduced the splendid period of humanistic knowledge which caused a tremendous increase and development of science. The founder of modern astronomy, Nicholas Copernicus, was a scholar of Cracow University. The number of schools, primary and secondary, governed by religious orders, especially the Jesuits, increased remarkably. The Academy of Wilno, founded by the Jesuits, was raised to the status of a university by King Stephen

Batory in 1579. In Lwow, the Jesuits' College was raised in 1661 to the level of a university by King John Casimir.

During the seventeenth century Poland had to wage constant wars to repulse invasions by the Turks, Swedes, and Russians, and these wars weakened her greatly. In the eighteenth century Poland, extending from the Baltic almost to the Black Sea, was still a large country, the third in size among European states. However, owing to the exhausting wars fought in the seventeenth century and to the lack of a strong executive, she was growing weaker internally. Moreover, the system of electing kings proved disastrous for Poland, in so far as it provided foreign powers with an opportunity to interfere in Polish elections. In 1764, Catherine II of Russia imposed on the electors her own candidate, Stanislaw Poniatowski, who was the last king of Poland. He was entirely under the influence of Russia, which did all it could to maintain chaos in the country. An attempt at resistance was made, and the Confederation of Bar, a military league to rid Poland of the Russian troops, was formed under the leadership of Casimir Pulaski, who later became one of the heroes of the American Revolution. The Confederation broke, and in 1772 the first partition of Poland took place. Prussia annexed Pomorze, i.e., the Baltic coast, Russia the eastern provinces, and Austria the southeastern parts.

Deeply shaken by this disaster, the Polish people started stupendous internal reforms: the first modern Ministry of Education in Europe, the so-called *Educational Commission*, was created in 1773, the treasury and army were reorganized, and a new constitution was voted on May 3, 1791. (That day has since been a Polish national holiday.) The Constitution of May 3 established the foundations of modern government on democratic principles. At that time only England, France, and Poland had liberal constitutions, all other countries in Europe being ruled by despotic regimes. The autocrats of Russia and Prussia called the democratic Polish constitution "anarchy" and annexed further provinces of Poland in 1793. Thereupon General Thaddeus Kosciuszko issued a proclamation calling the Polish nation to arms. After a few initial victories Kosciuszko was defeated, and Poland lost her freedom in 1795 (4). The third Polish pharmacopeia, *Pharmacopoeia Castrensis Et Nosocomialis Exercitus Nationalis*, for use in the Army hospitals, published in 1794, was dedicated to this Polish, and later also American, national hero (3).

Resulting from the recommendation of the *Educational Commission* of 1773, the whole system of education had been reorganized. Since then in all the schools the language of instruction has been Polish instead of the former Latin. Natural sciences reached a high level of teaching.

The chair of pharmacy and materia medica was created in Cracow in 1782, and Master of Pharmacy and Doctor of Medicine Jan Szaster (1741-1793) was appointed professor. Originally Dr. Szaster lectured in his own apothecary shop where he also arranged a pharmaceutical laboratory and a materia medica collection. Students of pharmacy as well as students of medicine attended. He also taught pharmacists forensic (toxicologic) chemistry. Szaster's apothecary shop can be justly regarded as the cradle of the Polish scientific pharmacy. He was succeeded by his cousin, Antoni Szaster. Later the chair of pharmacy was taken over by Jozef Sawiczewski, a pharmacist, pioneer of the pharmaceutical industry in Poland, who was succeeded by his two sons, Julian and Florian. Florian Sawiczewski, a pharmacist and physician, studied in Paris, Vienna, and Berlin, and was the author of several scientific papers, and editor of

the pharmaceutical journal, *Pamietnik Farmaceutyczny Krakowski* (Cracow Pharmaceutical Memoirs) (1834-1836). Altogether the Sawiczewski's family occupied the chair of pharmacy in Cracow for about seventy-five years (5).

In Wilno, the chair of pharmacy and medical chemistry was founded in 1785, the staff of which included the prominent professor Jedrzej Sniadecki, and later, Jan Wolfgang. The latter Master of Pharmacy and Doctor of Philosophy had written many research papers published mainly in the first pharmaceutical journal in Poland, *Pamietnik Farmaceutyczny Wilenski* (Wilno Pharmaceutical Memoirs), of which he was editor in chief. This journal appeared in 1820-1823, and later was continued under the changed title *Dziennik Medycyny, Chirurgji i Farmacji* (Journal of Medicine, Surgery, and Pharmacy) (5).

Throughout the nineteenth century the Polish nation did not lose hope of regaining independence. During the Napoleonic era, General Dabrowski formed Polish legions to fight on the side of France in Italy. (It was then that the song "Poland Is Not Yet Lost" was composed, later to become the national anthem of reborn Poland.) Napoleon intended to re-establish the Polish State and created its nucleus, the Duchy of Warsaw in 1806. Three years later the "Medical Academy" was founded with a chair of pharmacy and pharmacognosy, called at that time "pharmacology," in Warsaw (1809). Professor Jozef Celinski, author of the textbook, *Farmacja* (Pharmacy), and a number of original research papers, had graduated in Berlin, and, in 1819, had been awarded the honorary degree of Doctor of Philosophy by the reorganized Warsaw University (6).

After Napoleon's fall, the Congress of Vienna in 1815 assigned the major part of Poland to Russia, with the stipulation that Poland should have self-government. During the period of the so-called "Congress Kingdom" the fourth chronologically and the first "official," i.e., obligatory in all pharmacies, Polish pharmacopeia was published in 1817. Its title was: *Pharmacopoeia Regni Poloniae, Auctoritate Ministerii Administrationis Rerum Internarum Et Disciplinae Publicae* (3, 7).

Tyranny exercised by the Tsar induced the Polish nation to rise in 1830 and to free itself from Russian bondage. This insurrection was, however, suppressed after a year's war, and the last shadow of freedom was taken away from Poland. Needs of the day were reflected in the publication of the military *Pharmacopoeia Castrensis Polonica* by the Polish government early in 1831 (3). The country was deprived of her autonomy, and the universities in Warsaw and Wilno were closed. With respect to pharmacy a paradoxical situation arose. According to the law then still in force (since 1809), only graduate pharmacists were allowed to manage drugstores, but there was no possibility of gaining required degrees in Poland. Therefore the authorities consented to the opening of the "School of Pharmacy" in Warsaw in 1840 (8). A new hospital pharmacopeia was published in 1838, and its next edition appeared in Warsaw in 1860 (3).

A new law devoted exclusively to the regulation of the pharmaceutical matters was promulgated in 1844. Curiously enough this law persisted in force for over a century in the central provinces of Poland. The law of 1844 regulated the entire practice of pharmacy, determined the number of pharmacies to be opened according to the needs of inhabitants, and laid down the rules pertaining to number of rooms in the premises and their equipment and to the periodical inspections conducted by the governmental authorities. The licenses, "concessions," were restricted to the lifetime of the concessionaire. The law, however, secured the rights of widows and underaged children.

In 1857 there was opened in Warsaw the "Medico-Surgical Academy," and the then-existing School of Pharmacy became part of this new institution. In 1862, the Academy merged with the new university named the "Chief Warsaw School." The two years' full-time study in pharmacy covered the following curriculum: inorganic chemistry, organic chemistry, analytical chemistry, botany, physics, mineralogy, zoology, pharmacy, posology, first aid, and pharmacognosy. The last, for the first time under such a proper name, was taught by the prominent pharmacist, Ferdinand Werner (8). The famous Polish botanist, Edward Strasburger, after the liquidation of the School, went to Germany to become professor at the University of Bonn. His textbook of microscopic botany, *Das Kleine Botanische Practicum* (1886), was written also in Polish and published in Warsaw in 1887 (1).

The Chief Warsaw School was an excellent center of Polish culture and learning but, unfortunately, a short-lived one. When the notorious "conscription" occurred, that is, forcible calling-up of Polish youths to the Russian Army, a new rising broke out in January, 1863. A secret revolutionary government was formed in Warsaw with Romuald Traugutt as its head. But the insurrection was eventually suppressed (1864), although with great difficulty, and thousands of Poles were executed. Traugutt and others were seized and deported to Siberia. Henceforth Poland was treated with the utmost ruthlessness, no effort being spared to Russify the nation. The Chief Warsaw School was liquidated in 1869, and a Russian university took its place. The Poles were deprived not only of their university but also of elementary education with Polish as a language of instruction.

In the Austrian occupied but semi-autonomous province of Galicia, in the city of Lwow, the Pharmaceutical Society was organized in 1869. The Society's activity included the publication of its journal, *Lwowskie Czasopismo Aptekarskie* (Lwow Apothecary Journal), and financial help to students of pharmacy of Lwow University (pharmaceutical instruction started there in 1855), and to widows of the Society's members. Teodor Torosiewicz of Lwow (1789-1876), an active pharmacist and chemist, became known as a pioneer in the study of Polish mineral waters. He analyzed the chemical composition of 169 various springs in Poland and Austria. His publications became known internationally (1). Another prominent pharmacist, Ignacy Lukasiewicz (1822-1882), was responsible for the creation of the oil industry in Poland (the first oil industry in Europe). He was the first to obtain kerosene from raw petroleum by distillation and to use the product for illumination. In Krosno, where he operated his apothecary shop, he established the first distillery in 1852. On July 31, 1853, Lukasiewicz succeeded for the first time in having kerosene used for the illumination of a public building, the Lwow Hospital. The lamps used were of his invention and design. A year later he started selling his kerosene to Vienna. American kerosene was exported to Austria first in 1862 (1, 9). In 1932, in the independent Republic of Poland, a statue of Lukasiewicz was erected in Krosno by funds raised by Polish pharmacists.

It is of interest to note that according to the law of October 9, 1809, the requirements for admission to the School of Pharmacy and to the School of Medicine of the Medical Academy of Warsaw were identical. Then prospective pharmacists were required to complete a two year program, whereas medical students had a four year curriculum. Later, higher requirements for candidates applying to the Medical School were introduced. Generally, physicians tended

to underestimate the importance of a better secondary education and sound professional training for pharmacists. The prevailing ideas at that time are illustrated by the attitude of the "General Medical Council" in Warsaw in connection with the reorganization of the Medical Academy (established in 1809) and the fusion of this Academy with the "School of Law and Administration" into the "Royal University of Warsaw" in 1817. While the improvement and expansion of the program in the medical department of the newly organized university was discussed in much detail, nothing was said with respect to some appropriate changes in the pharmaceutical curriculum. The opinion of the General Medical Council, an influential body at the time, read as follows: "The apothecary's duty is merely to sell to his customers for a decent price medicines prescribed by approved physicians" (6). No wonder that in such an atmosphere, and under such adverse political circumstances, pharmaceutical sciences could not flourish. All the more credit is due to professionally minded university professors, for their unquestionable merits in keeping in touch with the advances of science in the West and for transmitting modern ideas to their students. These professors and their scientific work, despite difficulties, as well as the remarkable achievements of some practicing pharmacists, have built up a glorious tradition of which Polish pharmacy can be proud.

Pharmacists tried hard to improve the system of the professional education. A little-known fact is that Professor Teofil Lesinski of Warsaw (1821-1860), a pharmacist and author of a textbook on chemistry in two volumes and of twenty-four original papers, put forward a plan of reform of the pharmaceutical studies in 1858. He suggested the introduction of a three year full-time program. The candidates would have been required to meet a matriculation standard. Unfortunately this plan did not materialize (8).

In the last decade of the nineteenth century, Professor Marceli Nencki (1847-1901) entered the scene. Dr. Nencki, one of the most prominent Polish scientists of the international repute in field of biochemistry, studied in Cracow, Jena, and Berlin. He wrote about 200 papers on his researches and was the author of the first synthesis of salol (1886). Although he spent twenty years teaching in the Berne University, Switzerland, Nencki kept in touch with his native country and was a member of the Academy of Science in Cracow. It was the time when the expanding development of chemistry and chemotherapy, biochemistry, immunology and bacteriology, called for the cooperation of all other scientific workers to explore the growing fields of the natural sciences, which had hitherto been left mainly to physicians. The introduction of proprietary medicines, tablets, injections, etc. created the pharmaceutical industry. Such an industry originated in retail pharmacies in Poland: Karpinski's (founded in 1788), Spiess' (1803), Gessner's (1844), Klawe's (1860), "Motor," Wenda's, Bukowski's, Nasierowski's, and Gasecki's (all of them became active in the second half of the nineteenth century). The need for well-educated pharmacists able to cope with the continuously increasing demands of modern medical treatment became obvious. Dr. Nencki became an ardent advocate of suitable reforms of pharmaceutical studies. In a public speech in Warsaw in 1892, he outlined the many changes. He felt that it should be essential for candidates to attain a matriculation standard prior to their enrollment in the university (such requirements were at that time in force with respect to medical students). That would have meant a sufficient knowledge of Latin and modern languages (English, French, or German) as well as mathematics through trigonometry, some cultural

subjects, and a proper background in chemistry, physics, and zoology. This was to be followed by a four year course at a university. Graduates would then be qualified to work not only as retail pharmacists but also as public analysts and chemists in the pharmaceutical industry. These suggestions, however, were not welcomed by the majority of his contemporaries. In Warsaw these ideas were ignored by the Russian University existing there since the liquidation of the Chief Warsaw School in 1869.

During World War I, Dr. Nencki's proposals were reconsidered, and a special commission was set up to work out a plan for the future training of pharmacists. Two pharmacists participated in the work: Bronislaw Koskowski and Wladyslaw Zoltowski; both at that time were officials in the Public Health Department of the Warsaw City Council. Their work constituted a basis for the first modern pharmaceutical curriculum adopted by the Polish universities after the regaining of full national sovereignty in 1918 (10). Bronislaw Koskowski (1863-1946) was a most venerable pharmacist in modern Poland. His life and activity were devoted to the elevation of the pharmaceutical profession to higher scientific and social levels. Author of several textbooks and innumerable articles, he was called upon to head the Pharmaceutical Division of the Faculty of Medicine and, from 1926, the completely independent Faculty of Pharmacy of the revived University of Warsaw.

In restored Poland there were twenty institutions of higher learning. Pharmacy was taught in the five state-owned universities (Warsaw, Cracow, Wilno, Lwow, and Poznan), and the following, uniform, educational requirements were established:

1. Preliminary education: a certificate of graduation from a gymnasium (the approximate equivalent of two years of an American college).
2. Professional education: a three year university course. During the last year of studies a research paper had to be written and approved. After a final, comprehensive examination, the degree of Master of Pharmacy (*Magister Farmacji*) was granted.
3. Professional experience: three years of internship in a pharmacy after completion of the university studies.

A fulfillment of these requirements gave the pharmacist the right to manage a drugstore and made him eligible for participation in contests for licenses authorizing the opening of a new pharmacy. Instruction was established in the following subjects: physics, botany (general), botany (taxonomy), pharmaceutical botany, crystallography, mineralogy, geology, zoology (parasitology), inorganic chemistry, organic chemistry, analytical chemistry (qualitative), analytical chemistry (quantitative), pharmacognosy (two years of instruction), bacteriology, pharmaceutical chemistry, toxicologic (forensic) chemistry, industrial chemistry, dispensing, cultivation of medicinal plants, and first aid. The curriculum was somewhat overloaded considering the wide range and thoroughness of subjects all of which but one required laboratory work. As a result, the percentage of students completing their studies in the prescribed time was rather low.

In 1930, a new reform took place, and pharmaceutical professional education was extended to a four year course (11). The following subjects were added: zoology (anatomy and physiology), physical chemistry, physiological chemistry, foodstuff chemistry, pharmacodynamics (pharmacology), manufacturing pharmacy, forensic pharmacy (pharmaceutical law), hygiene, and history of pharmacy.

All these subjects were required. Two subjects omitted from the new program were crystallography and geology. Between 1932 and 1939, the five universities were graduating over 200 Masters of Pharmacy a year. After further study and experimental research contributing significantly to science, the Master of Pharmacy could take special examinations and then defend his thesis. If successful, he was granted the degree of Doctor of Pharmacy (*Doktor Farmacji*) (11).

In partitioned Poland there were in force three foreign pharmacopeias: Austrian, Prussian, and Russian. The Seventh Edition of the *Pharmacopoeia Austriaca* (1895) was translated into Polish, and a good commentary to it was written by Wilhelm Zajaczkowski, Master of Pharmacy. In 1907, the Eighth Edition of the same pharmacopeia was translated, and an excellent commentary, written by Dr. J. Lemberger and Dr. S. Droba, was published in two volumes. The Prussian (later German) and Russian pharmacopeias have never been translated into Polish. The three foreign pharmacopeias served as official standards for many years in independent Poland. Although an appropriate committee was created as early as 1917, the work was not completed, and the new Polish Pharmacopeia was not published until 1937, under the designation *Pharmacopoea Polonica II*, i.e., the second edition, the *Pharmacopoeia Regni Poloniae of 1817*, being considered as the first official edition.

According to the governmental regulation of July 1, 1937, all pharmacies were supposed to "keep in stock, prepare, analyze, and dispense medicaments in conformity with the Polish Pharmacopeia's standards." The equipment necessary for analytical examinations, if deficient, had to be acquired by January 1, 1939, to correspond to the list included in the pharmacopeia. This list of minimum equipment to be possessed included an analytical balance and a microscope.

The Act of Parliament (on "exercising the pharmaceutical profession") passed in 1938 charged retail pharmacists with the personal responsibility for the quality of drugs supplied to the public. The pharmacist also had to check maximum doses on prescriptions unless the doses in excess of the pharmacopeial maximum were especially required by the physician, to supply drugs at any time during the day or night, and, to keep in his pharmacy all drugs listed in the pharmacopeia as well as other nonofficial drugs required by government order.

In exchange for these moral and material responsibilities the pharmacist was granted the monopoly of the sale of most drugs (some of them were allowed to be sold in so-called "drogerie" stores operated by so-called "druggists" with no pharmaceutical education). Competition was also largely eliminated since the number of pharmacies and their distribution over the country was based on the number of inhabitants according to a definite ratio altered from time to time. In 1939, this ratio was one pharmacy to 4,000 people in towns of 4,000 to 25,000; one pharmacy to 5,000 in towns of 25,000 to 50,000; one pharmacy to 6,000 in towns of 50,000 to 100,000; one pharmacy to 7,000 in towns of 100,000 to 250,000; and one pharmacy to 8,000 people in cities of 250,000 upwards. In villages of under 4,000 inhabitants a new pharmacy could be opened if the nearest existing drugstore was not less than four miles away (10).

On the other hand, as was true in other countries with limited numbers of pharmacies, the people were protected from abuse by very elaborate lists of governmentally fixed prices. These lists not only fixed prices for drugs, but also rates for the pharmaceutical work done in compounding prescriptions in accordance with the amount of time required and technical skill involved.

When a new pharmacy was to be opened, a contest for the concession of the pharmacy was announced by the province authorities. A successful winner (a higher academic degree, number of years spent in the capacity of an employee, and the civic activity of the candidate were usually the decisive factors) was supposed to open the pharmacy within one year from the date of his license. If he failed to do so, the license (concession) became void. The ownership of such new, and of most of the old established pharmacies in Poland, was based on the system of "personal" concessions for the lifetime of the concessionaire. After the death of the owner, a pharmacist who was granted the concession had to pay the heirs of his predecessor the actual value of the goods and equipment of the pharmacy.

Apart from that type of personal concession there were in existence in western and southern provinces of Poland, in the territories formerly occupied by the Germans and Austrians, two other types of concessions: "privileged" pharmacies which could be disposed of any time at their owners' desire, and "real" concessions, the sale or inheritance of which required governmental confirmation with each change. In the area of the so-called "Incorporated Lands" which meant the northeastern Polish provinces annexed by Russia (in contradistinction to the territory of the "Congress Kingdom" created in 1815, i.e., Central Poland) the pharmacies established prior to 1918 were hereditary and vendable to anyone at any time, the only condition being that the managership had to be in the hands of a pharmacist.

To make the matter still more complicated, there were a few municipal pharmacies and some health insurance pharmacies. The health insurance authorities had established their own pharmacies mostly in industrial areas and larger cities with a higher proportion of insured people. The legal requirements with respect to the ratio of the number of drugstores to the number of inhabitants were observed, but considering the scope of activity of these new establishments, covering a large proportion of people, they deprived the private pharmacies of a great part of their income (10). There were also pharmacies located in the larger hospitals to satisfy the needs of the hospital services only.

The average private pharmacy consisted of several rooms: a large sales and prescription department, a stock room, a galenical laboratory, an analytical laboratory, a basement for storage of perishables with a separate section for inflammable materials, and a room for the pharmacist on night duty. All pharmacies were, by American standards, prescription or professional drugstores. Goods having nothing in common with pharmacy such as toys, newspapers, handbags, or sandwiches were not sold. Even cosmetics were not sold to any great extent. Large shop windows were either empty or exhibited only materials of an educational nature, e.g., the production of medicinal chemicals, the cultivation of medicinal herbs, or, exhibits of various medicinal plants preserved in sulfurous acid, colored tables on recognition of edible and poisonous mushrooms, types of venomous snakes, etc. The so-called "rural" pharmacies in the very small villages and "seasonal" stores in health resorts were not required to have analytical or galenical laboratories.

In 1937, the total number of pharmacies in Poland was 2,260, which included 2,064 privately owned (in this figure 4 exclusively homeopathic, and a few municipal drugstores), 85 health insurance and 111 hospital pharmacies manned with the total number of 5,205 of qualified staff (10).

The supervision of pharmacies as well as pharmaceutical industry was the responsibility of the Ministry of Health, created in 1918. After its liquidation in 1923, the Ministry of Labor and Social Welfare absorbed its duties and established a separate Pharmaceutical Section. This Section was in charge of control of the manufacture and distribution of narcotics, registration of pharmaceutical establishments and pharmacists, licensing new Polish proprietaries and foreign ones, and drafting new laws and regulations.

The supervision was carried out by the local authorities. Acting in their behalf and in the behalf of the Ministry, there were provincial pharmaceutical inspectors, sixteen in number (corresponding to the number of provinces), plus one inspector for the city of Warsaw with one assistant inspector. The duties of these inspectors comprised of: periodical inspections of pharmacies, drugstores (the so-called "drogerie"), and shops selling poisons for technical purposes, wholesale drug houses, drug manufacturing laboratories and factories of artificial mineral waters; dealing with concessions for new and old pharmacies; supervision of the personnel employed in pharmacies, approval of properly qualified managers in wholesale houses and in some departments in pharmaceutical manufacturing laboratories; keeping detailed records of the qualified personnel in these establishments, records of proprietaries manufactured in the factories and pharmacies in the respective provinces, records of medicinal plants, wild and cultivated, gathered in respective areas; cooperation with other authorities in matters pertaining to pharmacy.

However, it was the periodical inspection of pharmacies that kept the inspector busy most of the time. During these inspections, lasting four to six hours at a time, in addition to controlling local records of narcotics bought and sold, suitability of equipment possessed, etc., he analyzed vegetable and chemical drugs and simpler galenical preparations on the spot. In case of a doubtful result or an inability to conduct the analysis within a short time or an assay requiring some special apparatus, samples were forwarded to the Public Institute of Hygiene in Warsaw to be assayed. While seeing to it that the pharmacies were of the highest level attainable, the pharmaceutical inspector defended the interests of public health and, last but not least, the interest of private pharmacists, by fighting notorious abuses of the so-called "druggists" (not pharmacists) chronically entering the pharmacist's field by selling medicines over the counter and occasionally carrying on a clandestine dispensing of prescriptions brought in by people unaware of their status. The institution of pharmaceutical inspectors who were, of course, pharmacists themselves, for the first time in Poland conducting their work without any interference from the medical profession, added much to the dignity of pharmacy in that country.

The pharmaceutical manufacturing industry, which originated in retail pharmacies in the eighteenth and nineteenth centuries, began to flourish again after the redemption of the country's independence in 1918. Fine chemicals of home production gradually appeared on the market: arsphenamine, silver protein products, barbituric acid derivatives, salicylic acid and its derivatives, vitamins, beta-pyridine carboxylic acid diethylamide, hormones, bismuth compounds, synthetic hydrastine (1934), wool fat, opium alkaloids prepared by extraction of poppystraw (1935), etc. (10).

The chemical industry of Poland in general was centered about the manufacture of fertilizers, coal derivatives, dye stuffs, products of wood distillation, artificial fibre, oils, soap, scents, paints, explosives, celluloid, and plastics.

The medicinal herb industry in Poland, and the part played by pharmacists in its development, deserves a special mention. Doctor of Pharmacy Waclaw Strazewicz (faculty member of Wilno and later professor of Poznan University) and Dean Jan Muszynski of the University of Wilno contributed considerably. The development of smut-resistant varieties of *Mentha piperita* and *Valeriana officinalis* and the acclimatization of the Mediterranean, American, and Asiatic plants to the rather severe climate of Wilno goes to their credit. After long experimentation, they succeeded in growing the unknown soybean plant in Poland. The results of their work were published in their book, *Soja*, in 1933.

In collaboration with military pharmacists, a substitute for absorbent cotton wool was found. It was obtained from flax. This product, not greatly inferior to absorbent cotton, has been subsequently manufactured on a large scale. Production of aromatic oils was not sufficient for the home market. Large quantities of aromatic oils were imported as well as chemicals. Export of vegetable crude drugs and their home consumption were considerable. The largest centers of the medicinal herbs industry were located in the province of Wilno. Jan Bieganski, a practicing pharmacist, has done much to popularize the use of herbs by writing several books on this subject for laymen. Dean Muszynski published a book on the microscopic analysis of vegetable drugs in powdered form in 1926.

Dean Muszynski and Doctor of Pharmacy P. Oficjalski have succeeded in isolating new alkaloids from several species of the family of clubmosses (*Lycopodiaceae*). One of them, selagine, obtained from *Lycopodium selago*, and having a pilocarpine-like activity (1) has been introduced into ophthalmologic therapy in Poland.

The study of the toxicologic (forensic) chemistry and (from 1930) foodstuff chemistry, pharmacodynamics and manufacturing pharmacy, was in the Polish faculties of pharmacy obligatory. This fact has had its consequences. Some pharmacists with modern training have found positions in the Institute of Forensic Medicine in Warsaw as analysts for legal cases. Some have occupied positions of analysts of foodstuffs. A number of pharmacists were actively engaged in manufacturing processes and control as well as in research departments of pharmaceutical manufacturing houses. Most of them, quite naturally, worked in retail pharmacy.

There were two main pharmaceutical organizations: *Polskie Powszechne Towarzystwo Farmaceutyczne*, grouping chiefly pharmacy owners and lessees, and *Zwiazek Zawodowy Farmaceutow Pracownikow*, grouping employees. Membership was not compulsory. The advancement of professional standards and defense of commercial interests were the main aims of the first; conditions of work, salaries, and welfare of members and their families were matters of paramount interest in the second. Their weekly journals were: the old established *Wiadomosci Farmaceutyczne* (Pharmaceutical News) and *Kronika Farmaceutyczna* (Pharmaceutical Chronical) respectively. A group of pharmacists, regardless of their status, that of an owner or employee, organized their own association *Nowa Farmacja* (New Pharmacy) and they owned a monthly journal, *Farmacja Wspolczesna* (Modern Pharmacy). The elevation of the pharmaceutical professions to higher scientific and social standards was the primary purpose of this young and ambitious association.

Another organization with purely scientific aims was *Towarzystwo Przyjaciol Wydzialow i Oddzialow Farmaceutycznych Przy Uniwersytetach w Polsce* (Association of Friends of Faculties of Pharmacy in Poland). This body was

in charge of publishing the *Polish Pharmacopeia,* organizing refresher courses for pharmacists, and promoting scientific research as well as publishing a bimonthly journal, *Acta Poloniae Pharmaceutica.* Original research papers, doctor's theses, etc. constituted its main content.

In the territory formerly occupied by Austria, there were in existence the so-called "Gremia" (one in Cracow and another in Lwow), official organizations of pharmacists of respective areas, constituting advisory and auxiliary bodies to the governmental authorities. They served as examining bodies for the so-called "assistants," i.e., men with some practice in pharmacy but without the university education. These examinations were discontinued some time after the redemption of the country's independence. The welfare of disabled members and widows was one of the aims of these Gremia. The Gremium of Lwow (as was true of *Polskie Powszechne Towarzystwo Farmaceutyczne* with headquarters in Warsaw) owned a splendid building with meeting halls, library, analytical laboratory, etc. It published its own journal called *Czasopismo Aptekarskie* (Apothecary Journal), a continuation of the old established *Lwowskie Czasopismo Aptekarskie* (Lwow Apothecary Journal).

An organization, embracing all categories of pharmacists with a compulsory membership of the whole area of the country, had long been a common desire of the profession. This was met by the Act of Parliament, passed in 1939, creating a "Chief Chamber of Pharmacy" (*Naczelna Izba Aptekarska*) in Warsaw and "Chambers of Pharmacy" (*Izba Aptekarska*) in each province. The rights and duties of this professional organization, according to the fourth paragraph of the Act, were to be:

1. Representing all pharmacists and protecting their interests.
2. Cooperating with governmental authorities in professional affairs.
3. Keeping records of pharmacies and their personnel.
4. Advising on any proposed acts and regulations pertaining to pharmacy.
5. Raising and maintaining standards of professional ethics.
6. Insuring that new graduates in pharmacy carry on their internship (first three years of practice) under proper conditions.
7. Maintaining by all means available the most up-to-date professional knowledge of its members.
8. Maintaining the welfare of its members; arranging for an appropriate insurance scheme for pharmacists and their families.
9. Supporting scientific institutions.
10. Exercising disciplinary jurisdiction.
11. Solving disagreements among its members by reconciliatory actions.

Due to the outbreak of the war and a new partition of Poland in 1939, this Act could not be put in operation. Once again Poland lost her independence.

The position of the pharmacist, in the Polish Army, Navy, and Air Force, was exactly the same as that of physician and dentist. There were three groups within the "Health Service Corps": Pharmaceutical, Medical, and Dental. The military training in Poland was compulsory, and graduates of these three callings had to attend the military "Central Sanitary School" in Warsaw for one year. After having completed the training, the men were granted the commissioned rank of a second lieutenant. Then they constituted the "Officers of Reserve Corps," and while in civilian life, they were called every two years for some additional training of four to six weeks duration. They could be promoted in this way to the rank of captain. Military pharmacists, career officers, could be promoted to full colonelship. Apart from their work in the military hospital pharmacies, they were active in the analytical work and research in the Military

Institute of Medical Supplies and in the Chemical Warfare Institute in Warsaw. There was no controversy with respect to the only proper position of the pharmacist in the Forces. The high standard of his education was a decisive factor in obtaining this position.

Socially, the position of the Polish apothecary was similar to that of his French, German, and Italian colleagues. He had been the typical representative of the middle class. Throughout the ages, members of the profession had been awarded all the honors which civil life had to offer. Very often pharmacists were found as municipal deputies, as mayors of even the largest towns, and, in times of national emergency, as was true in 1863-64, as heads of the secret national administration, and, in time of the independent Polish Republic, as members of Parliament. Nevertheless, the old system of apprenticeship and some peculiarities of this semi-scientific and semi-commercial calling were sharply criticized. In the literature, the best example of such criticism was a well-known novel, *Pigularz* (Pillroller), written by Waclaw Gasiorowski.

Within the period 1918-1939, the progress of pharmacy in Poland was enormous. The accomplished necessary reforms in the field of pharmaceutical education were of utmost importance in shaping public opinion to recognize pharmacy as a dignified profession with many ramifications not limited to retail outlets alone. On the other hand, the concept of the retail pharmacy as a public institution rather than a commercial business, with all its right and duties, under the supervision of pharmacists themselves, appointed by the government, was a determining factor in stressing the dignity of this ancient calling. The legal foundations for a partly self-governing pharmaceutical community were laid down in 1939. The future could have been bright.

World War II and the postwar period are not covered in this paper. There are many interesting, and sometimes inspiring, points in this most recent history of pharmacy on the Polish soil. Not the least is such a phenomenon, never met in any other country, as the underground pharmacy schools, carried out in spite of the threat of concentration camps. This part of the history of the Polish pharmacy calls, however, for a separate work (11).

SUMMARY

A history of Polish pharmacy from its beginning is outlined. The development of pharmaceutical education, literature, and legislation is discussed. Due attention is paid to the variable political circumstances under which Polish pharmacy has been shaped. Works and contributions of distinguished Polish pharmacists are reviewed.

The rapid development of pharmacy in reborn Poland in the period 1918-1939 is described in some detail. Education, legislation, retail pharmaceutical practice, pharmaceutical manufacturing industry, governmental supervision system, associations and their journals, position of pharmacists in the military service and in some specialized fields of work, and social standing of pharmacists in general are discussed.

REFERENCES

(1) Muszynski, Jan, *Acta Polon. Pharm.* 5, 71-76 (1948).

(2) Glowacki, Witold W., "Slask sredniowieczny wzorem dla aptekarstwa polskiego," Wydawnictwa Instytutu Slaskiego, Katowice, 1941.

(3) "Farmakopea Polska," Wydanie III, Panstwowy Zaklad Wydawnictw Lekarskich, Warszawa, 1954, pp. 9-14.

(4) Dyboski, Roman, "Outlines of Polish History," A Course of Lectures delivered at King's College, University of London, George Allen and Unwin Ltd., London, 1931.

(5) Rembielinski, Robert, *Farm. Polska* 5, 167-169 (1949).

(6) *Ibid.*, 228-232 (1949).

(7) Urdang, George, *J. Hist. Med.* 1, 46-70 (1946).

(8) Rembielinski, Robert, *Farm. Polska* 5, 306-312 (1949).

(9) Urdang, George, "Pharmacy's Part in Society," American Institute of the History of Pharmacy, Madison, Wisconsin, 1946.

(10) Grabowski, Mateusz B., *Biuletyn Farmaceutyczny, The Pharmaceutical Bulletin, Organ of the Polish Pharmacy Abroad*, 3, 40-73 (1948).

(11) Saski, Witold and Henryk Bukowiecki, *Am. J. Pharm. Ed.* 22, 34-50 (1958).

I have the highest regard for Mark Hopkins' log and the student at the other end of it, even though the humorists have recently told us that the log has been sawed up to form state boards.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 256 (1937)

ANTIBIOTIC TESTING*

RAYMOND W. VANDERWYK

Since the first clinical trial of penicillin in 1941 the application of antibiotic therapy in infectious diseases has steadily increased. We have now reached the point where about 43 per cent of all prescriptions contain one or more of the known antibiotics. The over-all effectiveness of the antibiotics can not be denied. They are indispensable in our fight against bacterial and fungal infections. If only they would act within uniform or determinable results in all instances! That this is not true was first noticed in 1945 with the observation that 14 per cent of all micrococci were resistant to the action of penicillin. Since that time the development of resistant strains of many bacteria has been reported against practically all of the major antibiotics. This is particularly true of the micrococci, and the figure of 14 per cent mentioned a moment ago has now risen to over 50 per cent.

It is not within the scope of this paper to discuss the reasons for this disturbing situation. Suffice it to say that the susceptibility of many pathogenic bacteria to antibiotic therapy can not be predicted without first performing an *in vitro* sensitivity determination.

Our students, therefore, should have a thorough knowledge of the antibiotics. They should understand the uses, misuses and abuses of antibiotic therapy in medical practice. This is especially true now that certain external preparations of the antibiotics have been released for over-the-counter sales. The logical place in our pharmacy curriculum to teach this material is in our courses in microbiology. It seems hardly necessary to state that laboratory work in the antibiotics is of prime importance in conjunction with the lectures. In this way the student will be able to observe exactly how the antibiotics behave against any number of selected organisms.

I would like, therefore, to suggest several laboratory exercises which illustrate the methods used today in testing for antibiotic sensitivity and for antibiotic assay. In addition to correlating information given in lectures, it is not beyond the realm of possibility that some of our students will be doing work of this type in later years, especially if they become associated with ethical pharmacies which have laboratory facilities.

In the addenda to this article will be found exercise sheets to illustrate: (1) the paper disk method for testing antibiotic sensitivity; (2) the serial tube dilution method for the assay of penicillin; (3) the Oxford cup method for the assay of penicillin.

1. The Paper Disk Method

This method is easy to carry out, it often shows dramatic results, and it affords a good means for comparing the effectiveness of several antibiotics on a single Petri plate.

It is advisable to use as many different kinds of bacteria as possible. In our laboratory we use eleven organisms which illustrate most of the possible morphological types. Each student is assigned one organism. In addition other students work with a throat culture from their own throats.

* Presented to the Section of Teachers of Biological Sciences, AACP, Miami, Florida, 1955.

Sensitivity disks can be purchased from Difco Laboratories, Detroit, Michigan. They represent small circular pieces of filter paper impregnated with three different strengths of seven antibiotics. Each antibiotic is represented by a different color.

The procedure is simple. Each student streaks a nutrient agar plate with the assigned organism or a blood agar plate with a swab from the throat. The antibiotic sensitivity disks are distributed equidistant apart on the surface of the agar. After incubation for twenty-four hours at 37 degrees Centigrade, the plates are examined. If the antibiotic is effective against the organism, a clear, circular zone of inhibition will be noted around the sensitivity disk. These zones are measured in millimeters, and the results are recorded on a chart. A glance at this chart will immediately tell which of the antibiotics used is most effective against a particular organism.

The culturing of throat swabs illustrates the practical significance of the method. Assuming that each student had a sore throat, the proper selection of an antibiotic can be made. The results invariably indicate that an antibiotic showing good results for one individual would have little or no effect if used by another.

2. The Serial Tube Dilution Method for the Assay of Penicillin

This method is used primarily to assay a solution of an antibiotic of unknown strength, but it can also be used to test for sensitivity.

The most interesting and impressive results are obtained by growing a penicillin-producing strain of *Penicillium* in an appropriate broth and assaying the broth in order to determine how many units of penicillin per cc. of broth were produced. This is done by preparing a number of dilutions of standard penicillin containing a known number of units per ml. The broth culture of *Penicillium* is filtered through a sterile Seitz filter to remove the mold. The filtrate is then serially diluted a number of times using sterile tubes. A penicillin-sensitive strain of *Micrococcus pyogenes* var. *aureus* is added to all tubes of the standard and unknown penicillin dilutions. After incubation, the tubes are examined for growth. The highest dilution showing no growth is the end point. By comparing the end points of unknown to the standard, the number of units of penicillin per ml. of unknown broth can be determined.

The procedure requires about two weeks to complete, and considerable glassware is necessary. It is an excellent exercise for small classes, particularly a graduate group of five or six students. It can be used to illustrate the assay of any soluble antibiotic and by varying the organism it can be used to ascertain very accurately the sensitivity of any antibiotic against any strain of organism.

3. The Oxford Cup Method for the Assay of Penicillin

The two methods for testing or assaying antibiotics just described are the ones most commonly used. The only other one which deserves mention and which could be used in a laboratory course in microbiology is the Oxford cup plate method. This method is restricted chiefly to the assay of penicillin and is a modification of the disk method. In this method agar plates are seeded with a broth culture of *M. pyogenes* var. *aureus*. Small glass or stainless steel cups are distributed over the surface of the agar. Into these cups are poured different dilutions of a penicillin solution the strength of which is unknown. Solutions of penicillin containing known amounts of penicillin are similarly

treated. After incubation, the zones of inhibition of the unknown and standard penicillin dilutions are compared. It is thus possible to determine the number of units of penicillin per ml. in the unknown solution.

The chief importance of the antibiotic tests described in this paper is to impress upon the student the following aspects of antibiotic behavior:

1. The usual spectrum of an antibiotic.
2. Practical laboratory procedures whereby the therapeutic effectiveness of an antibiotic can be anticipated.
3. The possibility of the development of resistant strains of an organism against the commonly used antibiotics.

ADDENDA

Determination of Sensitivity of Various Bacteria to Antibiotics by the Paper Disk Method

Object: To familiarize the student with a method which can be used to determine the sensitivity of various microorganisms to the more commonly used antibiotics.

Materials:

1. Nutrient broth cultures of the following organisms:
   - *M. pyogenes* var. *aureus*
   - *M. pyogenes* var. *albus*
   - *B. subtilis*
   - *S. lutea*
   - *E. coli*
   - *A. aerogenes*
   - *Ps. aeruginosa*
   - *K. pneumoniae*
   - *P. vulgaris*
   - *S. marcescens*
   - *A. fecalis*
2. Nutrient agar and blood agar plates.
3. Bacto-sensitivity disks.
4. Forceps.
5. Sterile swabs.

Procedure:

1. Place several drops of the broth suspension of the organism assigned to you on the surface of a nutrient agar plate. Streak the inoculum in a uniform fashion over the surface of the medium. Allow excess moisture to evaporate.
2. If you have been assigned a throat culture, obtain a sterile throat swab. One of the instructors will obtain material from your throat. Completely inoculate a blood agar plate with this material.
3. Distribute Bacto-sensitivity disks on the surface of the plates equidistant apart. Use the strength of antibiotic assigned to you. Handle each disk with forceps which have been flamed and cooled.
4. Refrigerate all plates for one hour to allow the antibiotic substance to diffuse into the agar before bacterial growth begins.
5. Incubate all plates at 37 degrees C. for twenty-four hours.

Observation and Record:

1. Examine the plates and notice any zones of growth inhibition around the disks. These will appear as clear areas.
2. Measure the diameters of these zones and express in millimeters.
3. Record the results of your work on the master chart on the front blackboard.
4. When the results of all members of the class have been recorded on the chart, copy it into your laboratory notes. Use the chart supplied to you for this purpose.
5. If you were assigned a throat culture, place the results of your work on the front board. Use your desk number as a means of identification. Underline the name of the antibiotic you would select if you had a sore throat.

The Production of Penicillin and its Subsequent Assay by the Oxford Cup Method and the Tube Dilution Method

I. *Production*

Penicillin is an antibiotic produced by a number of species of *Penicillium*, notably *P. notatum* and *P. chrysogenum*, as a result of its metabolic activity in suitable liquid culture media.

Select a known penicillin-producing strain of one of the above species. Inoculate 100 cc. of mycophyl broth or corn steep liquor contained in a 250 cc. flask. Incubate at 25 degrees C. for ten to fourteen days. Agitate daily during the period of incubation.

Note the luxuriant green-colored growth and the golden-yellow droplets of liquid which exude out on the surface of the mycelium.

Filter about 25 cc. of the broth through a sterile Seitz filter. It is now ready to be assayed according to the methods outlined below.

II. *Assay*

A. *The Oxford Cup Method*

In principle this method depends upon the diffusion of penicillin from material placed in cups on agar plates seeded with the test organism. Any penicillin-sensitive culture of *M. pyogenes* var. *aureus* may be employed, but it is advisable to use a standard strain such as the F.D.A. 209-P strain.

1. Inoculate a tube of brain heart infusion broth with the organism and incubate for sixteen to twenty-four hours at 37 degrees C.

2. Into sterile Petri plates pour 21 cc. of melted nutrient agar. Allow to harden. Use glazed porcelain covers in order to eliminate water of condensation.

3. Add 2 cc. of the broth culture to 100 cc. of nutrient agar which has been melted and cooled to 45 degrees C. Mix well and add 4 cc. to each plate already containing 21 cc. of the base agar. Tilt the plates to distribute the inoculum evenly. Allow to harden.

4. The cups are small cylinders made of glass or stainless steel. They should be of uniform diameter and sterile. One end of each cylinder is warmed by passing through a bunsen flame and set lightly on the surface of the seeded agar. The cups should not be warm enough to sink into the agar. Properly sealed cups do not permit any free liquid to escape from the cup during the entire incubation period. Six cups are placed equidistant around each plate. After setting the cups each plate should be immediately returned to refrigerator until they are to be used.

5. Prepare six dilutions of standard penicillin in sterile 1 per cent phosphate buffer. Ordinarily the dilutions carry 0.2 to 2.0 units per cc. For our work we shall prepare dilutions containing the following amounts in each cc.: 0.5, 1.0, 2.0, 3.0, 4.0, and 5.0 units.

6. Fill each cup nearly to the top with each of the above dilutions. A single sterile medicine dropper or pipet may be used. Be sure to indicate the dilution in each cup by marking with a wax pencil.

7. If the broth to be tested is believed to contain less than 1 unit of penicillin per cc. it need not be diluted. Fill a cup with the fluid. For our work we shall employ the following dilutions: 1:4, 1:8, 1:16, 1:32, 1:64, 1:128. Fill a cup with each of these dilutions.

8. Incubate both plates at 37 degrees C. for twenty-four hours.

9. After incubation, different sizes of clear circular zones of inhibition of growth of the organism are observed depending on the concentration of penicillin in the cups.

10. Measure the zone diameters in millimeters for each cup carrying the six dilutions of standard penicillin and prepare a standard curve as shown in Figure 231 in Kolmer, "Approved Laboratory Technic," page 572.

11. Measure the zone diameters for the material being tested and project from the ordinate horizontally to the standard curve and thence vertically to the abscissa which gives the unitage of penicillin producing the same zone inhibition as the fluid being tested. Multiply by the dilution factor to express the penicillin content of the material in terms of units per cc. Greatest reliability of results is obtained if the values for the unknown fall within points of the standard curve corresponding to about 0.3 to 1.4 units per cc.

B. *The Serial Tube Dilution Method*

1. Arrange 10 small (13 x 100 mm.) sterile culture tubes in a rack. Place 1.8 cc. of brain heart infusion broth containing 0.25 per cent glucose in No. 1 and 1 cc. in each of the remaining tubes.

2. Add 0.2 cc. of the filtered *Penicillium* broth to be tested to tube No. 1; mix and transfer 1 cc. to No. 2; mix No. 2 and transfer 1 cc. to No. 3 and so on to No. 10 from which 1 cc. is discarded after mixing. The final dilutions are now 1:10, 1:20, 1:40, 1:80, 1:160, 1:320, 1:640, 1:1280, 1:2560, 1:5120.

3. Prepare a solution of standard penicillin in cold saline solution or 1 per cent phosphate buffer carrying four units per cc.

4. Set up a second series of small sterile culture tubes and place 1.5 cc. of sterile brain heart infusion glucose broth in No. 1 and 1 cc. in each of the remaining tubes. Add 0.5 cc. of the solution of penicillin to tube No. 1; mix and transfer 1 cc. to No. 2; mix No. 2 and transfer 1 cc. to No. 3 and so on to No. 10 from which 1 cc. is discarded after mixing. The tubes now contain 1, 0.5, 0.25, 0.125, 0.0625, 0.031, 0.016, 0.008, 0.004, and 0.002 units respectively.

5. Cultivate any penicillin-sensitive strain of *M. pyogenes* var. *aureus* in nutrient broth for twenty-four hours at 37 degrees C. Dilute 1:1000 with sterile nutrient broth and with a sterile 1 cc. pipet add a drop to all tubes of both series.

6. Prepare a culture control of 1 cc. of nutrient broth to which is added 1 drop of the diluted culture.

7. Mix and incubate all tubes at 37 degrees C. for twenty-four hours.

8. The culture control should show a good growth. Examine the series of tubes carrying the varying amounts of penicillin and record the smallest amount of penicillin in units (highest dilution) showing inhibition of growth. Examine the series of tubes carrying the specimen tested and record the highest dilution showing inhibition of growth.

9. Multiply the highest inhibiting dilution of the specimen by the smallest inhibiting amount of penicillin in units. The result expresses the approximate amount of penicillin in units per cc. of *Penicillium* broth as per the following example.

Highest inhibiting dilution of *Penicillium* broth 1:80
Smallest inhibiting amount of penicillin ..... 0.008 units
80 x 0.008 equals 0.64 units of penicillin per cc.

Corrections in Winter, 1958 Issue

Editor's Note: The following corrections have been noted by the authors involved and corrections requested: (1) Page 22, fifth paragraph, last sentence should be "Undoubtedly the law which limits the number of *pharmacies* is a very important factor in the thriving prescription business which is highly conducive to the professional atmosphere of the pharmacy." (2) Page 118, second column, second paragraph, third sentence should be "If Diperodon, Meprobamate, Mephenesin Carbamate, Ethinamate, Neostigmine, Salicylamide, Salicylanilide, and Pantothenic Acid must be discussed in succession, why should Carbachol be grouped with *choline* derivatives?"

GRADUATE ENROLLMENT DATA, SEPTEMBER, 1957 AND GRADUATE STUDY IN MEMBER COLLEGES FOR 1958-1959

Early in January the third annual report on graduate study was mailed to the deans, department heads, and librarians of all member colleges. The report included enrollment data for September, 1957, as was true last year for September, 1956, and for the first time included brief statements addressed to prospective graduate students, and describing the major areas of professional graduate instruction. Summary of certain data from the report is included here, as well as the table showing the member colleges that will be offering programs in one or more professional areas in 1958-1959.

Abbreviations of the table are: M—master's program; D—doctor's program; *—program available to students with a B.S. in Pharmacy but offered in departments of a parent university other than in its college of pharmacy. For additional explanatory notes see the Winter, 1956, issue of the *Journal*, p. 82.

Fifty-two institutions are listed as having graduate programs available for 1958-1959. One of these is outside the continental limits of the United States, and three others do not sponsor the programs within the college of pharmacy. Forty-eight member colleges within the country, therefore, sponsor graduate programs within the college in one or more areas of professional instruction.

Forty-six of these forty-eight colleges reported one or more graduate students enrolled in September, 1957. Three hundred seventy-five students were candidates for master's degrees, 291 for doctor's degrees, and twenty-two were special students. An additional nine pharmacists were master's candidates and thirty-seven were doctor's candidates in other units of parent institutions, giving a total of pharmacists engaged in professional graduate study in institutions having member colleges of pharmacy of 384 master's candidates, 328 doctor's candidates, and twenty-two special students. The grand total is 734, twenty-seven more than in September, 1956. When pharmacists known to be pursuing graduate study in other institutions are added, the total for pharmacists pursuing graduate study in September, 1957, undoubtedly exceeded 750.

Forty-seven colleges report that one or more types of local financial aids will be available to new graduate students in 1958-1959. There will be at least eighty-six fellowships and scholarships, 210 assistantships, and forty-six internships in hospital pharmacy available. This is an increase of forty-nine local aids over a year ago. The local aids do not include a considerable number of AFPE fellowships which will be available. Also to be added are general university scholarships or other aids for which pharmacists may apply. Twenty-two colleges report that such aids will be available for new students in 1958-1959. Additional aids preempted for 1958-1959 by current holders bring the total of all aids to a figure estimated to be in excess of 600. This means that some form of financial aid is available to at least four out of each five graduate students.

A majority of the fellowships are for sums between $1,400 and $1,800; the assistantships between $1,200 and $1,800; and the internships between $1,650 and $2,400. Remission of tuition or adjustment of out-of-state differential is variable.

A list of administrative officers (usually the dean) and college addresses is given in the complete report, which is available gratis from the Secretary, AACP, 833 So. Wood Street, Chicago 12, Illinois.

Richard A. Deno, Chairman
Committee on Recruitment Aids

TABLE I

Graduate Programs Available, 1958-1959

Member College	Phcy.	Ph. Ch.	Phcog.	Phcol.	Ph. Ad.	Ho. Ph.
Alabama P.I.	M	M	M	M		
U. Arizona	M	M	M	M	M	
U. California		M D		M* D*		
U. So. California	M D	M D	M D	M		M
U. Colorado	M D	M D		M M* DD*	M M* DD*	
U. Connecticut	M D	M D	M D	M D		M
G. Washington U.				M* D*		
U. Florida	M D	M D	M D	M D		
U. Georgia	M	M		M	M*	
U. Illinois	M	M D	M D	M* D*		
Butler U.	M	M		M		
Purdue U.	M D	M D	M D	M D	M	M
Drake U.				M		
S. U. Iowa	M D	M D		M* D*	M* D*	M
U. Kansas	M	M D	M	M D*	M*	
U. Maryland	M D	M D	M	M D		M
Massachusetts	M D	M D	M D	M	M	M
U. Michigan	M D	M D		M* D*	M* D*	M
Wayne S.U.	M	M	M	M		M
U. Minnesota	M D	M D	M D	M* D*	M* D*	
U. Mississippi	M	D*		D*		
St. Louis C.P.	M					M
U. Kansas City	M	M		M		
Montana S.U.	M	M	M	M		
U. Nebraska	M D	M D	M D	M D		M
Rutgers U.	M	M		M		
Brooklyn C.P.					M	
Columbia U.	M	M	M	M		
St. John's U.	M	M				
U. Buffalo	M	M D		M* D*		M
U. No. Carolina	M D	M D		M*	M* D*	
No. Dakota A.C.	M	M	M	M		M
Ohio S.U.	M D	M D	M D	M D	M D	M
U. Cincinnati		M				
U. Oklahoma	M	M	M	M		
Oregon S.C.	M D	M D	M D	M D		
Duquesne U.	M	M	M	M		
Philadelphia C.P.	M D	M D	M D	M D		M
Temple U.	M D	M D		M D		M
U. Pittsburgh	M D		M	M	M D	
U. Philippines	M D	M D	M D	M*		
U. Rhode Island	M D	M D	M D	M D	M*	
M.C. So. Carolina				M* D*		
So. Dakota S.C.	M	M	M	M		
U. Tennessee		M*		M* D*		M
U. Houston	M	M	M	M	M*	M
U. Texas	M D	M D	M D	M D	M* D*	M
U. Utah	M D	M D	M D	M D	M*	
M.C. Virginia		M D		D*		M
S.C. Washington	M D	M D	M D	M D		
U. Washington	M D	M D	M D	M* D*		
U. Wisconsin	M D	M D	M D	M* D*	M D	
Total	44M 24D	44M 28D 1M* 1D*	31M 18D	33M 14D 14M* 15D*	8M 4D 11M* 6D*	19M

REPORT OF THE DELEGATE TO THE AAAS

The one hundred and twenty-fourth annual meeting of the American Association for the Advancement of Science was held in Indianapolis, Indiana, December 26 through December 30, 1957. The Pharmacy Section (section Np) held eleven sessions which were co-sponsored by the American Pharmaceutical Association, Scientific Section; the American Association of Colleges of Pharmacy; the American Society of Hospital Pharmacists; the American College of Apothecaries; and the National Association of Boards of Pharmacy. The program was arranged by Robert C. Anderson, Eli Lilly and Company; George F. Archambault, U.S. Public Health Service; John E. Christian, Purdue University; Joseph A. Oddis, American Hospital Association; and Glen J. Sperandio, Purdue University. Dean Karl L. Kaufman, School of Pharmacy, Butler University, was the local program adviser.

Two general sessions of contributed papers were held. Some twenty-five papers were presented in these sessions. G. S. Banker, J. E. Christian and H. C. DeKay of Purdue presented a paper on the distribution of phosporous compounds in tablet matrices using radioactive tracer techniques. The analysis of phenylephrine by filter paper chromatography was given by H. Shriftman and B. B. Stern of Wyeth. An interesting paper on methods for measuring sub-sieve size particles was presented by S. P. Eriksen, M. J. Robinson, D. R. Reese, and J. V. Swintosky of Smith, Kline and French Laboratories. R. S. Joslin presented work done by him and A. H. Chun and A. N. Martin at Purdue on the application of H.L.B. to the principle of mixed emulsifying agents. A paper on the effects of ultrasonics on the particle size of suspensions was given by O. E. Aravjo, Ohio Northern, and P. F. Belcastro, Purdue. These are some representative papers presented.

The Hospital Pharmacy group held two sessions which were arranged and presided over by George F. Archambault and J. A. Oddis. Papers presented in these sections dealt with such topics as legislative controls, labeling, economics, etc., in hospital pharmacy and were presented by Henry L. Verhulst, U.S. Public Health Service; R. W. Carithers, Methodist Hospital, Indianapolis, Indiana; J. W. Lansdowne, Eli Lilly and Company; A. A. Mannino, McKesson and Robbins, Inc.; and P. F. Parker, A.Ph.A., among others. A symposium on recent trends in medication was presented by C. J. York, Pitman Moore Company; R. H. Behnke, Veterans Consolidated Hospitals, Indianapolis, Indiana; H. D. Bryan, Mead Johnson and Company; and R. C. Bogash, Lenox Hill Hospital, New York.

A very interesting general symposium on a pharmacological approach to mental illness was attended by a large group of people. The participants in the discussion were Professor J. I. Nurnberger, Indiana University; Dr. J. Cole, National Institute of Health; Drs. I. H. Slater, and T. Verhave, Eli Lilly and Company; and Dr. Nathan S. Kline, Rockland State Hospital, Orangebury, New York. Dr. Kline pointed out the pitfalls encountered in placing too much faith on animal work in this field. His comments on the subject of animal vs. human tests evoked a spirited discussion.

One of the most interesting sessions was a round table discussion on metric implementation in pharmacy, medicine and chemistry. The partici-

pants were members of the Eli Lilly firm, which is, as is well known, the first pharmaceutical company to convert all operations (internal and external) to the metric system.

The discussion of their experiences in conversion is important because it is presumed that this is the beginning of a complete change-over to the metric system by all chemical and pharmaceutical houses.

Section Np cooperated with the Philosophy and Science Association in two sections on the topic, "Can Science Provide an Ethical Code?" This symposium was conducted by leaders in a number of different fields. The pharmacy groups were represented by Dr. K. K. Chen of Eli Lilly and Company.

All sessions were well attended. Continued support of the AAAS by pharmacy groups is desirable. Information regarding the December, 1958, meeting, to be held in Washington, D.C., may be obtained from the Secretary, Dr. John E. Christian of Purdue University, or Dr. George F. Archambault of the U.S. Public Health Service. Dr. Archambault is chairman of the 1958 meeting.

John M. Cross, Delegate

. . . the student of pharmacy deviates significantly from the non-pharmacy student in three of the interests: theoretical, social, and aesthetic. His most significant deviation is his lack of interest in the artistic episodes of life.

W. L. Van Buskirk, Am. J. Pharm. Ed., 2, 335 (1938)

EDITORIAL

Most any pharmacist will tell you that one of the major problems facing pharmacy today is the recruitment of students. The more discerning pharmacist will tell you we must recruit, but for quality, not quantity.

We in pharmaceutical education have our own problem of quality recruitment—for teachers of pharmacy.

I think every person in pharmaceutical education has a responsibility to leave it a better place than he found it. And one of the obvious ways to do this is to bring to it better teachers. I think personal example is probably the most productive method of bringing this about. We tell the practicing pharmacist that he's to blame for the problem in recruiting students because he has too much junk in his store—he's not professional. Tomorrow morning take a good look at your teacher colleagues. Does everyone look professional, act professionally, dress professionally? Does everyone take his responsibilities seriously? So you say college professors are by tradition rather seedy and haphazard. As a professional person you are denied this license. If we tell our students to act, dress, and be informed as professionals, we should realize that our example speaks louder than our words. If we expect to recruit teachers of high professional caliber to teach students of high professional caliber, we must first demonstrate what it is.

And remember in your recruiting, when you accept a graduate student, you are entrusting the future of the profession with him. A professor who accepts graduate students so the college will have cheap help (assistants), or recruits graduate students to do his research for him, or is simply interested in building up the number of graduate students enrolled, is an educational hypocrite who should be subject to the highest contempt. Unfortunately some of these people become deans! Equally deplorable is the person who fails to weed out the graduate students destined for teaching who do not fulfill the high standards of that responsibility. The student may be favored, but the profession is blasphemed.

To recruit for teachers, personal example and elimination of the unfit isn't enough; it takes real personal interest on the part of educators. How many students have you personally guided from the undergraduate classes into an interest in graduate study? If the answer is none, you're on the end of a dead limb, and the tree would be better off without you. There is no place in education for a basic inequality in instruction and guidance. I believe that all students must have an equal opportunity to demonstrate what they can do. However, we should not confuse equal opportunity with equal attainment. And I don't think college is any too early for students to learn that the world may give them equal opportunities before the law, but their actions will determine what rewards they will enjoy. If you have some superior students who seem to show the potential of teachers, invite them to your home. Show them how you live; talk with them about something besides pharmacy too. Show them that teaching gives one the opportunity to grow in the various dimensions of life and keeps the mind young and stimulated to increasing power.

Counseling is every educator's responsibility, and when a superior student qualifies in your judgment as a potential teacher, with personal interest and consultation, encourage him to take the courses which will fit him best for teaching. Encourage him to work at capacity, not at the speed of the mediocrity. Casually hand him books with, "You may find these interesting." Make a point to discuss them with him. If he's the man you think he is, he'll take to the bait like a fish out of season. A good potential teacher, like a good teacher, must always be looking for a renewed and continuing understanding of his subject. He finds it in good books and in good conversation. There is no place that I know outside the cloister which gives one the opportunity to engage in introspection and self-improvement as does college teaching. And when the seed is planted in your prospective teacher, care for it well. There will be arid seasons and there will be predatory animals, both of which will tax your ingenuity. As Albert Schweitzer has expressed it, "Anyone who proposes to do good must not expect to have people roll stones out of the way, but must accept his lot calmly if they roll a few more upon it."

And when you can, meet the parents of these potential teachers. This won't be difficult if you've done your work well—you won't be able to avoid it. Last year a graduating senior's father came to a pharmacy teacher before graduation and said, "I've come across the state to see my son graduate, but next to that the most important thing was to meet you. He's told me so much about you." From a smooth conversationalist this could have meant nothing. But these words were from a humble, honest man who spoke with the conviction which comes from saying only the things which one sincerely believes. This student and his teacher had talked of many things during their time together. I think the student gained a respect for teaching he never would have gotten otherwise. So had his father; and that's important too.

In my conversations with prospective graduate students who wish to go into teaching, I think the one point which impresses them most is the one which impresses me most. There is no ceiling to one's accomplishments in teaching except those we make for ourselves. Educators are free to teach, to change and re-teach, to improve, to experiment. There is that ever-present potential of personal reward for operating at top capacity. One is free to research in the areas of his interest, to change and re-direct his research, to communicate by writing and talking. As in only few professions, teaching does not require one to make compromises with one's conscience or ideals. As a teacher you may say what you know and believe is right with apologies to no one. It is an experience where the only justification for one's acts is in the solemn court of one's own conscience. You need never maintain a dogma out of courtesy to others or to yourself. Learning is a changing thing in which truths change and you with them. And the change is in itself invigorating. A good teacher is never satisfied with what he does; if he is, he's stupid or senile. In both instances he has no place in education. Learning to teach, as we must always continue to do, must be a process which is vital, alive, exciting, and unending. And a teacher must spread the contagion thoroughly in his classroom. The desire for more knowledge must always be part of us. As Mark Van Doren has said, "There is no greater happiness than that of having a desire which can never wear out."

And when you have recruited tomorrow's teachers, don't expect to be thanked. They will think they did it all themselves. And you will be able to practice another of *your* most important assets as a teacher and perpetual scholar: the priceless virtue of humility with its own marvelous, unsung rewards.

Melvin R. Gibson

Should we not rather lay our stress upon the development of teachers in the professions, upon the development of men who by their statuesque character, by a certain epic grasp of the significance of life, by their larger interpretations of the meaning of manhood and womanhood, rather than by mere knowledge, even though they themselves contribute to the creation of such knowledge and can impress students, both in the academic as well as in our professional schools. . . . The problem is to find such men. But if we place our hands in our lap and commit ourselves fatalistically to a laissez faire policy in such matters, we are not applying to the solution of this problem that acumen and sense of relative values which we have brought to the solution of many another problem in the educational field. Let us look for the man when we promote teachers, when we make our administrators and our leaders.

Alphonse M. Schwitalla, Am. J. Pharm. Ed., 1, 258 (1937)

MEMORIALS . . . . . .

JOHN FRANCIS McCLOSKEY

The nation has lost a pharmaceutical leader. On December 9, 1957, Dean John F. McCloskey passed away after an illness of several months. Typical of his energetic way of life, he worked almost to the end sorting, cataloging, and marking for disposition the files of pharmaceutical materials which had accumulated from his very active participation in pharmaceutical education and journalism, as well as files on military and civic endeavors. At the time of his death he was president-elect of the American Association of Colleges of Pharmacy. This honor, which he cherished, was bestowed upon him by his colleagues in pharmaceutical education because of his able committee work. He would have been installed as President of our Association at the Los Angeles meeting.

John Francis McCloskey was a native of Johnstown, Pennsylvania. He was born on May 19, 1894.

His entry into the pharmaceutical world began in 1911 as a drug clerk. The following year he became the owner and manager of a drugstore, which he continued until 1916. In the same year he served with General John Pershing in the Mexican campaign against Pancho Villa, and in 1917 he enlisted in the U.S. Army and became a first lieutenant in infantry. He participated in many of the famous battles of the Allied European Forces during which time he served with the British, French, and American Armies. Before the end of the war he was attached to the General Staff. He was decorated with the Purple Heart, Black Star, Etoile Noire, Legion of Honor, and six combat bars.

He returned from the first world war to New Orleans, Louisiana, where he enrolled in business administration at Tulane University. This was the beginning of his life long interest in business administration. He held two degrees B.B.A. which he earned at Tulane in June 1925, and M.B.A. in 1942. Because of this Tulane affiliation he became interested in Tulane's pharmacy graduates, and compiled the only accurate roll of its graduates after he became Dean of the College of Pharmacy at Loyola University. In 1926, he became a registered pharmacist in Louisiana and purchased a pharmacy in New Orleans which he operated for seven years.

Loyola University employed him in 1928 as a professor of business administration, a post which he held for four years before assuming the position as third dean of its College of Pharmacy in 1933. He immediately became interested in pharmaceutical standards and was chiefly responsible for correcting the loose pharmaceutical practices in vogue in the state at that time.

In 1938 he was founder of the Loyola University Student Branch of the American Pharmaceutical Association, one of the first active student branches in the nation. From his interest in this segment of pharmacy, came many proposals which have helped to unify that organization as an important part of the A.Ph.A. membership.

He was the recipient of the I. L. Lyons Loving Cup as the outstanding pharmacist in Louisiana for 1940.

In 1941, Governor Sam Jones appointed him as chairman of a committee to report on the pharmaceutical services in the fourteen state-owned hospitals. The result of this survey improved hospital pharmacy services in the state.

One of his outstanding contributions to pharmacy was made in his capacity as Editor of the *Louisiana Pharmacist* from 1943-1952. He helped considerably in promoting membership and interest in the Louisiana State Pharmaceutical Association as well as influencing its membership in constructive thinking concerning the maintenance of high standards for the profession.

Dean McCloskey had always been interested in history, and it was only natural that he would be one of the cofounders of the La Pharmacie Francaise Museum located at 514 Chartres Street in New Orleans. He was appointed by Mayor Maestri to the Historical Pharmacy Commission of the City of New Orleans in 1941 and continued to serve on the Commission until his death through subsequent appointments by Mayor De Lesseps Morrison. In addition, he was a member of the Council of the American Institute of History of Pharmacy.

He attended most of the American Pharmaceutical Association Conventions since 1933, and he served as chairman of several of the sections as well as being a presidential nominee of the American Pharmaceutical Association in 1954 and 1955.

He was named Man of the Month in the May, 1955, issue of the *Southern Pharmaceutical Journal* which indicates in southwestern pharmaceutical circles that you have made many commendable pharmaceutical contributions.

In the American Associations of Colleges of Pharmacy he served as Vice President in 1957 and was president-elect in 1958. He served on the Committee of Predictive Tests, and was a very tireless committeeman for the Section of Teachers of Pharmacy Administration. He was chairman of the Committee on Salaries of Pharmacy College personnel which prepared the first compilation of its kind in the history of the AACP.

His fraternal affiliations were many: Blue Key, Alpha Sigma Nu, Sigma Phi Epsilon, Tri Beta, Epsilon Kappa Sigma and Rho Chi. He served as a member of the Council of Rho Chi.

He was a member of the National Association of Retail Druggists and the Louisiana State Pharmaceutical Association.

Hospital Pharmacy interested him greatly. He was a member of the American Society of Hospital Pharmacists as well as its affiliate, the Louisiana Society of Hospital Pharmacists.

All of his efforts were not confined to pharmacy. He gave much of his energy to serving as President of the New Orleans Knife and Fork Club, member of the Board of Directors of the Hotel Dieu Sisters Hospital, member in New Orleans Chamber of Commerce, Friends of the Cabildo (historical) American Legion, Disabled American Veterans, Veterans of Foreign Wars, and the Knights of Columbus.

He was listed in *Who's Who in America, Who's Who in the South,* and *Who's Who in Education.*

Through the years he developed many hobbies: book collecting, coins, woodworking, photography, and military history. Those who knew him best

marveled at his wide interests. In the latter years he appreciated greatly the week ends he spent on his farm at Franklinton, Louisiana.

Surviving Dean McCloskey are his widow Mrs. Mildred McCloskey (Mildred Louise Lambert) whom he married on June 3, 1930, and three children, John Francis, Jr., Mrs. Phares Frantz (Elinor Mae) who has two children (Ninette Marie, and Colleen Marie), and Dennis Vincent.

Edward J. Ireland

WILLIAM A. JARRETT

Dr. William A. Jarrett, Dean of The Creighton University School of Pharmacy for more than twenty-two years, died at his home in Omaha, Nebraska, Sunday, January 26, after an illness of four months.

Dr. Jarrett was born December 3, 1888, in Fiskdale, Massachusetts. He held the degree of Doctor of Pharmacy from the Massachusetts College of Pharmacy and Bachelor of Science from Duquesne University.

His first teaching position was at the University of Maine, where he was professor of pharmacy from 1913 to 1918.

His teaching career was interrupted when he accepted a research position with the United Drug Company for two years. This was followed by seven years in the practice of retail pharmacy. During this latter period he was the proprietor of two pharmacies in Springfield, Massachusetts. Poor health forced him to give up his pharmacies, and he went to Florida, where he recovered completely.

At this point he decided to return to teaching, and he accepted a position as assistant professor of pharmacy at the University of Florida from 1927 to 1928. He was professor of pharmacy at the University of Connecticut from 1928 to 1929 and at Duquesne University from 1929 to 1935.

He devoted much time and effort to the development of new formulas for pharmaceuticals and cosmetics. Over the years he has had numerous articles published in the leading pharmaceutical journals.

Dr. Jarrett came to Creighton University as Dean in September, 1935, succeeding Dean Howard C. Newton, who left Creighton to return to his alma mater, Massachusetts College of Pharmacy.

He was honored by the Omaha Pharmaceutical Association in 1955 at a testimonial dinner honoring his twenty years as Dean. He was one of two long-time Creighton University faculty members honored at the annual President's Convocation at the University on October 8, 1957.

He was a member of Rho Chi, Phi Delta Chi, the American Pharmaceutical Association, Nebraska Pharmaceutical Association, Omaha Pharmaceutical Association, and the American Institute of the History of Pharmacy. He is listed in *Who's Who in America*.

He is survived by his widow, Alice Rooney Jarrett, three daughters, a brother, and a sister. Funeral services were held Wednesday, January 29, at St. Cecilia's Cathedral in Omaha. Eight deans from Creighton University were honorary pallbearers.

At the testimonial dinner in 1955, Dean Newton paid tribute to Dr. Jarrett when he stated: "Modest, calm, smiling and friendly, Dean Jarrett is a man of deep religious faith. He is the kind of man with whom fathers and mothers are glad to have their sons and daughters associate as students.

He unfailingly shows a great personal interest in each of his students. When he was asked about the greatest thrills of his professional life, he said: 'Every day has always been a thrill and a challenge to me. I don't know which have been the greatest, but I get the biggest thrill out of learning that a student with whom I had some scholastic or disciplinary trouble turned out to be highly successful in his profession and a leader in his community.' Isn't this the typical response of the man who is dedicating his life to teaching?"

Dr. Jarrett's diversified experience enabled him to incorporate much of it toward the improvement of pharmaceutical education at Creighton University. He will be greatly missed by his fellow pharmacists and educators, but his philosophy of life is something which will forever inspire those who knew him.

Salvatore J. Greco

CHARLES H. STOCKING

Charles H. Stocking was born in Stockbridge, Michigan, August 27, 1882, and passed away January 31, 1958, in Bradenton, Florida, where he had made his winter home for the past four years.

After a year of study at Albion College, he enrolled in the College of Pharmacy of the University of Michigan, where he earned the degrees of Pharmaceutical Chemist in 1907 and Bachelor of Science in 1909. Following a short period of service as professor of pharmacy and dean of the Kansas City College of Pharmacy, he was appointed professor of pharmacy and dean of the College of Pharmacy at the University of Oklahoma, serving in this position from 1912 to 1917. He held the position of research chemist with the Upjohn Company and later the same position with Eli Lilly and Company. In 1920 he joined the faculty of the College of Pharmacy of the University of Michigan, earning the degree of Master of Science there in 1925. He was advanced to associate professor in 1927 and became professor of pharmacy in 1944, acting director of the College of Pharmacy in July, 1947, and Dean of the College of Pharmacy in April, 1949. He retired as dean-emeritus and professor-emeritus of pharmacy during the summer of 1951.

Dean Stocking was co-author of the textbook *Fundamentals of Pharmacy* and co-author of *Arithmetic of Pharmacy*, a revised and enlarged text based on the original by A. B. Stevens, and author of numerous other publications in his field. He was President of the American Association of Colleges of Pharmacy in 1932-33, Vice President of the American Conference of Pharmaceutical Faculties in 1922-23, a fellow of the American Association for the Advancement of Science and a member of the American Pharmaceutical Association, Michigan State Pharmaceutical Association and Michigan Academy of Pharmacy. Phi Delta Chi, Tau Kappa Epsilon, and Rho Chi were included in his fraternal affiliations and he was a fifty-year member of Fraternity Lodge No. 262, F. and A.M., of Ann Arbor. At the time of his death he was a member of the Britton Methodist Church.

In 1909 Mr. Stocking married Miss Grace A. Cook, who died in 1947; in 1949 he married Mrs. Ethel B. Gregg, who survives, along with his two sons and seven grandchildren.

After his retirement, Dean and Mrs. Stocking had established a home on a farm near Britton, Michigan where he took an active interest in community affairs. Funeral services were held in Britton followed by burial in Stockbridge.

To his many former students and to his colleagues in the teaching profession, Dean Stocking was perhaps known best for his friendliness and his gentle compassion. He often spoke of being privileged to observe and participate in the progress which pharmacy had made during his lifetime. He was proud of his profession and instilled that pride in his students, who loved and respected him and through whom his influence will live on for many years.

Lee Worrell

LESLIE M. OHMART

Leslie M. Ohmart, Professor of Pharmacy and Chairman of the Department of Pharmacy of the Massachusetts College of Pharmacy, died on January 30, following a heart attack. Funeral services were held in the Wellesley Congregational Church of Wellesley, Massachusetts. He had been a resident of Wellesley for more than twenty years.

Professor Ohmart was nationally recognized as an outstanding leader in his profession. In 1954 he received the coveted J. Leon Lascoff Award from the American College of Apothecaries in recognition of the great contributions that he had made to the practice of pharmacy. His numerous accomplishments are well known to the members of the profession: his prescription clinics, his seminars on licensing examinations, his work on standards of accuracy in dispensing, his authorship of major chapters of the textbook, *American Pharmacy,* his many published research reports, his lectureship since 1936 at the Harvard School of Dental Medicine, and his work on dermatological preparations as a member of the Committee on Revision of the United States Pharmacopeia.

A member of the American Pharmaceutical Association since 1931, he was prominent in the work of the committees and of the sections of the Association. He had served as chairman of the Section on Education and Legislation. He was also active in the work of the American Association of Colleges of Pharmacy and had served as chairman of the Section of Pharmacy Teachers. As a Fellow of the American College of Apothecaries, he was a frequent participant on the programs of its meetings. During the past six years he conducted the seminars on licensing examinations at the annual meetings of the National Association of Boards of Pharmacy.

Professor Ohmart was born in Pittsburgh, Kansas, in January, 1901. He enlisted in the U.S. Navy in 1917 and was sent to the Harvard Radio School in Cambridge, Massachusetts. It was at this time that he met his wife, the daughter of a prominent Boston pharmacist, and they were married in November, 1918. On his release from the Navy he entered the Massachusetts College of Pharmacy, completed both the undergraduate and the graduate curriculum, and then earned two additional degrees at Boston University. He was later commissioned in the Medical Administrative Service Corps of the U.S. Army Reserve, and he worked in retail pharmacy, in hospital pharmacy, and as an instructor on the staff of the Massachusetts College of

Pharmacy, preparing himself for his career in pharmaceutical education. His great natural ability and his thorough preparation brought him successive promotions until he became professor of pharmacy and chairman of the Department of Pharmacy.

Professor Ohmart was "the professional" in the practice of pharmacy. His marvelous professional knowledge and skill were widely recognized, and his advice and assistance were eagerly sought by workers in all areas of practice in the health professions. In his passing the profession of pharmacy has lost one of its most capable workers. Truly he lived more than most men during his fifty-seven years.

Surviving Professor Ohmart are his wife, Dorothea; his two daughters, Elizabeth N. Spurr of Connecticut and Dorothea B. Parker of Hawaii; his son, Leslie, Jr., proprietor of a retail pharmacy in Maine; and eleven grandchildren.

Howard C. Newton

HARVEY A. K. WHITNEY

Harvey A. K. Whitney, founder and first president (Chairman) of the American Society of Hospital Pharmacists, died December 15, 1957, at the age of sixty-three. Mr. Whitney died at the University Hospital in Ann Arbor, Michigan, the place which was a second home to him. His death was sudden. He had entered the hospital December 2, was operated on December 5, for an abdominal aneurysm, and died ten days later following postoperative complications. He lies buried in Ann Arbor, survived by his wife Hildreth Whitney, his son Harvey Whitney, Jr., who is a junior student in the College of Pharmacy of the University of Michigan, his daughter Joan Whitney Braly, his brother Arthur of Adrian, and his sister Mrs. Gladys Woods of Fort Lauderdale, Florida.

Mr. Whitney will be long remembered as an inspiring leader in hospital pharmacy. Undoubtedly, his greatest contribution was to mold an obscure and unrecognized group of professional practitioners into a well-organized professional society. Under his dynamic leadership the American Society of Hospital Pharmacists was conceived, born, and nurtured, its principles dedicated to service for the patient, its objectives directed to stimulating hospital pharmacists to better prepare for this service through the improvement of standards of practice, of education and of training, and through the promotion of research and the dissemination of knowledge. The success of Harvey Whitney's inspirational leadership is characterized in the words of the eminent historian, Dr. George Urdang, who in 1952 wrote:

> Today, American hospital pharmacy represents a unit of purpose and ideals second to none in the world in its willingness to achieve and maintain the highest educational standards possible, and to be equal to whatever task the rapid progress of science and technic may offer to the pharmaceutical expert in the various fields of his professional advance.

The second contribution for which Mr. Whitney will be long remembered is his pioneering work in the establishment of hospital pharmacy internships in the United States. He began the first internship program at the University Hospital, University of Michigan, in 1927. In this work Mr. Whitney was far ahead of his time. It was to be more than a decade before the first

combined internship and graduate program would be offered to hospital pharmacists, by Spease at Western Reserve University, and still another ten years before the second and third programs would be offered, at Baltimore and Philadelphia.

Those who had the opportunity to receive their training under Mr. Whitney were enriched beyond measure. To his interns Mr. Whitney brought the inspirational qualities of kindness, patience, humility, generosity, courtesy, and sincerity which are the characteristics of a truly great teacher but ones to which students are too seldom exposed.

Mr. Whitney practiced what he preached. Under his guidance, the Pharmacy Department of the University Hospital became a *pharmacy service.* Members of the pharmacy staff, including interns, were well indoctrinated with this concept of professional service. As a result of his teachings and precepts, his department at the University Hospital expanded from a small dispensary to an outstanding unit offering a comprehensive professional pharmaceutical service which has served as an inspiration to many. By building a truly great pharmacy service within his own hospital, Mr. Whitney gave his answer to those who believe pharmacy's salvation lies in slogans, "public relations," or other superficial measures. Mr. Whitney's service through knowledge was his public relations for pharmacy—and it is the only kind which will ever be lastingly effective.

During his lifetime, Mr. Whitney participated in numerous activities for the advancement of pharmacy as a profession. He was responsible for the organization of the Sub-Section on Hospital Pharmacy of the American Pharmaceutical Association, which developed into the American Society of Hospital Pharmacists in 1942. In 1943, Harvey Whitney joined with Leo Mossman of Gallipolis, Ohio, to launch and edit the Society's first publication, the *Official Bulletin of the American Society of Hospital Pharmacists.* Mr. Whitney served as vice president of the American Pharmaceutical Association in 1940-41. He also served as chairman of the Section on Practical Pharmacy and Dispensing and chairman of the Sub-Section on Hospital Pharmacy. Mr. Whitney was a member of the Revision Committee of the *National Formulary* from 1939 to 1944, and chairman of the Subcommittee on External Preparations. He was the author of numerous articles pertaining to hospital pharmacy and related subjects. He was president of the Michigan Board of Pharmacy, and served as a representative of the NABP on the Committee on the Pharmaceutical Syllabus. Mr. Whitney was president of the Michigan Branch of the American Pharmaceutical Association, and a member of Rho Chi.

In 1950, the Michigan Society of Hospital Pharmacists honored Mr. Whitney by creating the Harvey A. K. Whitney Lecture Award, now given annually to the hospital pharmacist who has contributed most to the progress of the profession during the previous year. This award is now presented at the annual meeting of the American Society of Hospital Pharmacists.

In 1944, Mr. Whitney accepted a position in the Medical Service Department of the atomic material processing plant of the DuPont Company in Richland, Washington. In 1945, he was appointed Director of Pharmaceutical Research of Ortho Pharmaceutical Products of Linden, New Jersey. Later Mr. Whitney engaged in retail pharmacy practice in Inkster, Michigan.

Born in Adrian, Michigan, November 7, 1894, Mr. Whitney was graduated from Adrian High School in 1912. During the first World War he served in the Army and thereafter entered the College of Pharmacy of the University of Michigan where he received his Ph.C. degree in 1923. In 1925 he was appointed to the pharmacy staff at the University Hospital in Ann Arbor, and was named Chief Pharmacist in 1927.

The memory of Harvey A. K. Whitney will long be cherished by the members of the profession. As a teacher, student, hospital pharmacist par excellence, friend and leader, his ideas and his personality had a profound influence upon his profession.

Don E. Francke

HENRY EDWARD MELTON

Henry Edward Melton, a member of the faculty of the College of Pharmacy at Wayne State University, passed away suddenly on December 28, 1957. Born in Pine Apple, Alabama, on July 12, 1893, Professor Melton received his Ph.G. from the Birmingham Medical College in Birmingham, Alabama, in 1915. Before serving in the Armed Forces during World War I, Professor Melton worked at Parke, Davis and Company. From 1920 to 1925, Professor Melton was employed at the F. A. Thompson Company. He then served as chief chemist and was in control of manufacturing at the C. E. Jamieson Company for a period of twenty years. From 1945 to 1947, Professor Melton was vice-president and technical director with McKay Davis Chemical Company.

A past president of the Michigan Branch of the American Pharmaceutical Association and a life member of the American Pharmaceutical Association, Professor Melton began his teaching career at the Detroit Institute of Technology College of Pharmacy in 1947, as assistant professor of pharmacy. Professor Melton began teaching at Wayne State University when the colleges of pharmacy at Wayne State University and the Detroit Institute of Technology merged on June 1, 1957. He taught at Wayne until his death.

Mr. Melton was one of the founders and former charter members of the Michigan Academy of Pharmacy and was also a member of Kappa Psi Pharmaceutical Fraternity. He held patents on various pharmaceutical products and was associate editor for *Remington's Practice of Pharmacy*, Ninth and Tenth Editions. He had written numerous articles and papers for professional journals.

Mr. Melton's sense of humor made him popular with students and coworkers alike. He will long be remembered by his many friends. Professor Melton is survived by his children: Henry Edward, Jr., Paul Dupuis, James, Bizzele, Sally Ann, Mary Elizabeth, and Joseph Vernier.

J. Verne Crandall

NEW LITTLE PEOPLE . . . . . .

David Merman Gale—born to Dean and Mrs. Laurence E. Gale, Idaho State College.

Ann Louise Coker—born January 7, 1958, to Mr. and Mrs. Samuel T. Coker, University of Kansas City.

Mary Catherine Haupts—on February 15, 1958, became the daughter of Mr. and Mrs. Charles S. Haupts, University of Florida.

Nina Elizabeth Laffoday—born December 10, 1957, to Dr. and Mrs. Samuel K. Laffoday, Southern College of Pharmacy.

Joyce Anne Ferguson—born January 26, 1958, to Dr. and Mrs. Hugh C. Ferguson, Ohio Northern University.

Robert Edward Rogan—born October 27, 1957, to Mr. and Mrs. Peter R. Rogan, Wayne State University.

Diane Beth Meyers—born March 16, 1958, to Dr. and Mrs. D. B. Meyers, Butler University.

Diane Elizabeth Worthen—born January 29, 1958, daughter of Dr. and Mrs. Leonard R. Worthen, University of Rhode Island.

Kelly Ann French—Born April 1, 1958, to Mr. and Mrs. Donald I. French, State College of Washington.

MARRIAGES . . . . . .

Dr. Thomas D. Malewitz, Assistant Professor of Pharmacology and Pharmacognosy, University of Florida, to Miss Irene Little, December 21, 1957.

STAFF CHANGES . . . . . .

NEW STAFF MEMBERS

University of North Carolina. Mr. Carl Bauguess has been appointed director of the newly organized pharmacy extension department. Dr. George H. Cocolas who was formerly in pharmaceutical research at the National Drug Company has been appointed assistant professor of pharmaceutical chemistry.

College of the Pacific. Dr. Louis M. Barber has been appointed lecturer in hospital pharmacy. Dr. Harold Marks has been appointed lecturer in preventive medicine.

Wayne State University. Dr. Sereck Fox has been appointed professor of industrial pharmacy. Dr. Fox was formerly vice president for production and control for the R. P. Scherer Company.

Fordham University. Dr. Paul V. Buday has been appointed assistant professor of pharmacology. Dr. Buday recently received his Ph.D. degree from Purdue University.

Ferris Institute. Mr. James Hintze has been appointed to the staff. Mr. Hintze recently received his M.S. degree in pharmacy at Purdue University.

Ohio Northern University. Dr. Hugh C. Ferguson has been appointed associate professor of pharmacology. Prior to joining the Ohio Northern staff Dr. Ferguson was associated with G. D. Searle and Company, and the University of New Mexico.

Butler University. Mr. Russel Park has been appointed assistant professor of pharmacy. Mr. Park plans to receive his P.h.D. from Purdue University at the end of the current semester.

University of Georgia. Dr. Durward N. Entrekin has been appointed assistant professor of pharmacy. Dr. Entrekin received his Ph.D. degree from the University of Florida and for the past four years has been in the research laboratories of the E. R. Squibb Company. Dr. Charles L. Braucher has been appointed assistant professor of pharmacy administration. Mr. Braucher received his master's degree from the University of Nebraska, and has had experience in retail practice and pharmaceutical sales. Mr. Braucher was associated with Parke, Davis and Company for six years and has been associated more recently with Melpar, Inc.

University of Wisconsin. Mr. Richard Strommen has been appointed instructor and assistant director of the pharmacy department in the University of Wisconsin Extension Division.

Brooklyn College of Pharmacy. Mr. Charles H. Rabe has been appointed adjunct professor of pharmacy administration in the Graduate Department. Mr. Rabe is Manager of Special Projects with J. B. Roerig & Company.

CHANGES IN STAFF TITLES

North Dakota Agricultural College. Dr. Leo Schermeister has been promoted from associate professor of pharmacognosy to professor. Dr. Fred Galysh has been promoted from associate professor of pharmacology to professor. Dr. Muriel Vincent has been promoted from associate professor of pharmacy to professor. Mr. Richard O'Neill has been promoted to assistant professor of pharmacy administration.

Creighton University. Dr. Salvatore J. Greco has been appointed acting dean of the School of Pharmacy. Dr. Greco was also promoted from associate professor of pharmacy to professor. Mr. Sebastian C. Pirruccello has been promoted from assistant professor of pharmacy to associate professor. Mrs. Edmund Czerwinski has been promoted from assistant professor of biological sciences to associate professor.

University of Georgia. Dr. Charles W. Hartman has been promoted from assistant professor of pharmacy to associate professor.

GENERAL NEWS

Ferris receives grant. Ferris Institute Division of Pharmacy has been presented with an unrestricted research grant of $2,000 by the Upjohn Company to support current studies of potentially important medicinal plants of Michigan, distribution of allergenic plants of Michigan, and anti-epileptic properties of certain South American plants. The committee to administer the fund consists of Norris W. Dunham, chairman, Larlis K. Kazerovskis, and James C. Freck. Dean Edward P. Claus will serve as an ex-officio member of the committee.

Oregon State will be sixty. In October pharmacy instruction at Oregon State College will be in its sixtieth year. A post-graduate seminar will help celebrate the event.

Teppert receives degree. Mr. W. Allen Teppert, Assistant Professor of Pharmacology, Drake University, was awarded the Doctor of Philosophy degree by the State University of Iowa on February 8, 1958.

North Dakota receives grant. The School of Pharmacy of North Dakota Agricultural College has received a grant of $8,000 from the Atomic Energy Commission for the purchase of specialized equipment for instruction in radioisotope techniques.

British speaker at Minnesota. Dr. Arnold H. Beckett of the Chelsea College of Science and Technology, London, gave two lectures on the University of Minnesota campus. He first spoke to pharmacists and pharmacy students on the topic "Pharmacy in Britain," and then he addressed a seminar of graduate students, faculty, and industrial scientists on "Stereochemical Considerations of the Design and Mechanism of Action of Synthetic Analgesics."

Minnesota offers new program. The University of Minnesota now offers the doctorate degree in pharmaceutical technology in addition to the well-established fields of pharmaceutical chemistry and pharmacognosy.

Grolle publishes. Dr. Floyd A. Grolle, Instructor in Pharmacy Administration, University of Michigan, is author of the book *Casebook in Pharmacy* published April 10, 1958.

Arkansas schedules meet. The School of Pharmacy of the University of Arkansas has called a meeting of prepharmacy advisors from all colleges in the state. These advisors will be shown the facilities of the School and be addressed by the department heads of the School. A general discussion of the pharmacy curriculum will be included in the program.

Kansas City sponsors course. The School of Pharmacy of the University of Kansas City sponsored a four week course in civil defense radiological monitoring which was attended by approximately 150 professional people, including government and public health workers.

Fischer honored. Dr. Louis Fischer, University of Washington, was honored by the University of Washington chapter of Kappa Psi for his contributions to that fraternity. A banquet at the Fort Lawton Officer's Club was the scene of the event at which Dr. Fischer was presented with several gifts, including some furniture for his study.

PCP confers honorary degrees. Philadelphia College of Pharmacy and Science on February 27, 1958, at the Founder's Day Convocation conferred the honorary degree of Master in Pharmacy on Mr. Richard M. Bitner, pharmacist of Lansdale, Pennsylvania and Mr. John J. Hughes, pharmacist of Wilkes-Barre, Pennsylvania.

PCP faculty on the air. Members of the faculty of the Philadelphia College of Pharmacy and Science are participating in the University of the Air over Station WFIL-TV, Philadelphia, with seventeen weekly lectures on the general theme "You and Your Health."

Summer courses at PCP. The Fifth Annual Radiochemical Institute and a course on the preparation of parenteral products will be offered during the summer, 1958.

Bartilucci and Sciarra on TV. Dean Andrew J. Bartilucci and Dr. John J. Sciarra of St. John's University College of Pharmacy were guests on the ABC-TV Bontempis program discussing "The Medicinal Applications of Household Ingredients Used in Cooking." The audience response was so favorable a return discussion was scheduled.

Bartilucci honored. Dean Andrew J. Bartilucci of St. John's College of Pharmacy was recently the recipient of an honorary membership in the Queens County Pharmaceutical Society. There have been only three such memberships awarded in the history of the Society.

Kleinsinger honored. To commemorate the Silver Anniversary of Iota Chapter of Rho Pi Phi International Pharmaceutical Fraternity at St. John's College of Pharmacy, a testimonial dinner in honor of Professor Harold Kleinsinger, founder of the chapter at St. John's, was held on February 26, 1958, at the Officers Club of the Manhattan Beach Air Force Base in Brooklyn.

Purdue librarian to teach. Theodora Andrews, Pharmacy Librarian, Purdue University, has accepted a summer position teaching library science at Syracuse University for a six week summer session, June 30 to August 19. She will teach a course in the bibliography of the sciences and technical services in the Graduate School of Library Science.

COP sponsors conferences. College of the Pacific School of Pharmacy has been conducting refresher conferences on newer medicinal agents as a service to the pharmacists in and around Stockton. In addition to the bimonthly meetings in Stockton, a series of conferences is being conducted in the San Jose area, Santa Clara County, and in the Eureka area, Humboldt County. The average attendance is about sixty-five persons.

COP institutes clinical pharmacy. College of the Pacific School of Pharmacy has recently installed a clinical pharmacy to serve the student body and personnel of COP and to provide practical experience to students in the School of Pharmacy.

Mrs. Kihara to travel. Mrs. Cisco Kihara, Administrative Assistant to the Dean and Instructor in Pharmacy, College of the Pacific School of Pharmacy, is planning an extensive tour of Europe during the coming summer. She plans to visit schools of pharmacy on her tour.

Wisconsin institutes novel plan. A special incentive was provided retail pharmacists to attend the pharmacy management institute at the University of Wisconsin in March. Free room and board was given to the past pharmacy graduating class which had the largest "qualified" enrollment at the institute. To qualify, each graduate pharmacist needed to bring along a high school student who is interested in pharmacy as a profession. Then, the graduate class and accompanying student guests with the largest showing were provided with free dining and lodging. Attendance was computed regardless of the school from which the pharmacists graduated or length of course of study. Only total enrollment by year of graduating was used to determine the winning class. The University of Wisconsin Pharmacy Alumni Association offered the award.

Hammarlund to Denmark. Dr. E. Roy Hammarlund, Associate Professor of Pharmacy, State College of Washington, has been granted a sabbatical leave of absence for the 1958-59 school year. He will spend the year at the Royal Danish School of Pharmacy in Copenhagen continuing his studies on the isotonicity of solutions.

New journal. The Elsevier Publishing Company recently announced the publication of a new journal, *Journal of Chromatography*. The journal will be published bimonthly and contain approximately 100 pages. About fifty pages will consist of review articles, about forty pages of original articles, and ten pages of collected data. Data and editorial sections will be in English; reviews and papers will be accepted in English, French, or German. Manuscripts should be directed to Dr. M. Lederer, Institut du adium, 4 Avenue de la Convention, Arcueil (Seine), France. The subscription price is $15.00.

Kumler to Wisconsin. Dr. Warren Kumler, Professor of Chemistry and Pharmaceutical Chemistry, University of California, holds a Kemper K. Knapp Visiting professorship this semester at the University of Wisconsin.

Berman grant renewed. Dr. Alex Berman, Assistant Professor of Pharmacy, University of Michigan, has recently been awarded a renewal of a research grant by the American Society of Hospital Pharmacists from funds provided by Lederle Laboratories. Dr. Berman is studying the development of printed hospital formularies from 1642 to the present.

Rowe elected. Dean Tom D. Rowe, College of Pharmacy, University of Michigan, was elected recently to the presidencies of both the Michigan Academy of Pharmacy and the Michigan Branch of the American Pharmaceutical Association for 1958-59.

Brown receives Ph.D. Mr. Robert G. Brown, Assistant Professor of Pharmacy, University of Texas, was awarded the Ph.D. degree in pharmacology from the Medical Branch of the University of Texas in Galveston at the end of the fall semester.

Texas offers lecture series. The College of Pharmacy of the University of Texas is offering a lecture series in the form of a proseminar consisting of three lectures from each of a number of visiting lecturers in various fields of pharmacy. The first in the series was delivered by Dr. Albert M. Mattocks of the University of Michigan on the problems in formulation and pharmaceutical technology. Other speakers were Dr. E. A. Swinyard of the University of Utah speaking on pharmacology; Dr. Kenneth N. Campbell of Mead Johnson & Company speaking on foreign pharmaceutical industry; Dr. Albert B. Fisher, Jr., of the National Wholesale Druggists' Association speaking on the economics of the operation of modern pharmacies; Mr. John Seybert of Butler University speaking on the world aspects of crude drug production; Mr. Daniel Moravec of Lincoln General Hospital, Lincoln, Nebraska, speaking on hospital pharmacy; and Dr. Melvin Green of the American Council on Pharmaceutical Education speaking on problems in pharmaceutical education.

King leaves Wyoming. Dr. Theodore O. King, Professor of Pharmacology, University of Wyoming, resigned his position to become senior pharmacologist with Johnson & Johnson Research Foundation.

Dr. King terminated his eight years of service on the staff of the University of Wyoming on February 28, 1958.

Schaefer receives award. Dr. Hugo H. Schaefer, Dean Emeritus, Brooklyn College of Pharmacy, on April 21, 1958 in Los Angeles, California was presented the 1948 J. Leon Lascoff Memorial Award by the American College of Apothecaries in recognition for outstanding service toward the advance of the prescription practice of pharmacy.

A letter. The following letter was received from Mr. Edward P. Winters, Instructor of Pharmacy, and Ph.D. candidate, University of Florida. He has asked that it be published in this journal.

Dear Sir:

The February issue of the *American Professional Pharmacist* contains an article written by a Dan Reback, a practicing retail pharmacist, which should be called to the attention of every person involved in the teaching of pharmacy. In this article the author states that pharmacy is not a business and cannot be conducted as a profession if it is considered a business. Coming at a time when most retail men and pharmacy administration teachers are clamoring for more and more retail courses, including typing, salesmanship, and probably some graduate courses in drug store management, this article comes to my desk as a very refreshing stimulus. It is for this reason that I believe Pharmacist Reback's article should be called to the attention of not only the pharmacists in the field, but, more importantly, in the place where pharmacy begins, the schools and colleges of pharmacy in this country.

With the advent of the five year program rapidly approaching for most colleges of pharmacy, it would appear that now is the time to pull ourselves up by our own bootstraps to the level of professionalism we sincerely feel we have attained. The fact is, however, that at a time when pharmacy is at this very critical turning point in its history our schools will be increasing the emphasis on the business aspect of pharmacy to the point where this becomes one of the major departments.

From the practical standpoint, a foundation in pharmacy administration should be taught since so many of our graduates enter into the retail field, but to teach it as anything but an auxiliary course of secondary importance is superfluous in view of the apprenticeship and internship requirements of our states.

The vast majority of the practical applications of retail management are learned by experience in what is generally referred to as the informal part of education. One month of practical experience in a retail store is worth six months of classroom theorizing on business procedures which vary a thousand ways in a thousand different stores. During the college period, that is, the formal education of a pharmacist, we must emphasize the science and profession of pharmacy and related sciences to the point where the confidence that comes with knowledge is manifested by a highly trained professional individual rather than a good merchandising man or a window trimmer.

Our schools must not attempt to stress both the business and professional aspects of pharmacy equally lest we reach the point of diminishing returns where the pharmacist remains neither a professional man nor a businessman, but rather, as he is now, somewhere in between these two extremes. We must not permit our science and professional courses to be interrupted by the chimes of cash registers or the din of falling display material. These sounds rightfully belong in the retail store and should stay there. If the trend of instituting a course for every problem our students are likely to meet continues, our curriculum may soon become unrecognizable as belonging to a profession.

We must decide exactly what we are to be — a business or a profession — and we in teaching must decide in which direction we are going to bend the twig.

Sincerely,
Edward P. Winters

ACPE meets. At its annual meeting, January 15-16, the American Council on Pharmaceutical Education elected the following officers for 1958: George D. Beal, Pittsburgh, Pa., President; Joseph B. Burt, Lincoln, Nebr., Vice President; and Patrick H. Costello, Chicago, Ill., Secretary-Treasurer. The List of Accredited Colleges of Pharmacy was revised as a result of the survey of those colleges of pharmacy reexamined during the first semester of the academic year 1957-58 and now shows seventy-three Class A, one Class C, and two Class Y-2 colleges of pharmacy.

It was the decision of the Council that "After July 1, 1959, the listing of accredited colleges of pharmacy by classes (A, B, C, and Y) will be discontinued. Only those colleges qualified for full accreditation (comparable to the existing Class A designation) and those newly organized colleges currently holding Y classifications will be retained on the list of accredited colleges of pharmacy."

Tentative revisions of the standards of the American Council on Pharmaceutical Education, as published in the *Accreditation Manual*, were made by the Council and representatives of the Executive Committee of the American Association of Colleges of Pharmacy. The revised standards were brought before an open hearing at the conventions of the sponsoring organizations of the Council, the American Association of Colleges of Pharmacy, the American Pharmaceutical Association, and the National Association of Boards of

Pharmacy in Los Angeles during the week of April 20.

In a review of progress made by the accredited colleges of pharmacy during 1956-57, it was pointed out that five colleges occupied new buildings and six colleges were either beginning construction of new buildings or making plans to do so. In forty-eight colleges of pharmacy, a total of 396 publications were made by staff members, and two U.S. patents were issued during the past year to members of the pharmacy faculty.

OAS Fellowship Program. On July 1, 1958, the Organization of American States will begin an undertaking designed to help individual specialists as well as the OAS member states. A new fellowship program, recommended by the Inter-American Committee of Presidential Representatives, will enter into force on that date and will offer grants for advanced study or research to specialists throughout the Western Hemisphere. Qualified persons who are looking for an opportunity to do pure research, improve their professional skill through a postgraduate course, or enroll in an advanced technical course may apply now to the program. By offering advanced study abroad, the OAS hopes to increase the individual's contribution to his country of residence.

Interested persons should address their inquiries and requests for necessary forms to:

Technical Secretary
OAS Fellowship Program
Pan American Union
Washington 6, D.C., USA

Applicants will be screened by the OAS General Secretariat for technical or professional competence, including consultation with specialists in the given field. Awards will be made by the Secretary General of the OAS, taking into account the preferences expressed by the member states according to the fields of their most urgent needs, as well as the merits of each candidate. Over the years, the Secretary General will maintain a balance in the distribution between the number of fellowships available and the needs of the member states. Upon completion of their study, fellowship holders must return to their country of permanent residence.

According to the decisions taken by the OAS Council the program contemplates approximately 170 fellowships for 1958-59 and a minimum of 500 annually in the future. Grants will be made for periods ranging from three months to two years, covering such items as travel, registration and tuition fees, study or work materials, and room and board.

VA residencies. A larger number of residencies leading toward the Master of Science degree in pharmacy are offered by Veterans Administration and cooperating universities for the 1958 fall semester, VA said today.

Vernon O. Trygstad, VA pharmacy director in Washington, D.C., said the number has been increased from nine to twelve, to meet VA's need for pharmacists with specialized hospital training to fill full-time key positions in the agency's hospital system.

The two year residencies are a combination of university graduate study in hospital pharmacy and VA hospital pharmacy experience.

Residents will receive $2.18 an hour while working at VA hospitals for twenty-eight hours a week during the course. The hospitals will provide quarters and subsistence at a nominal charge.

Applications must be filed before May 1, 1958 with the Executive Secretary, Central Board of U.S. Civil Service Examiners, Veterans Administration, Washington 25, D.C.

Appointments will be made from eligible applicants who qualify for admission to the graduate schools of the University of Southern California, University of Pittsburgh, University of Iowa, Philadelphia College of Pharmacy and Science, St. Louis College of Pharmacy, and Butler University at Indianapolis.

Undergraduates may apply before they receive the B.S. degree in pharmacy in June, but must submit proof of graduation and of registration as a pharmacist before they can be appointed.

Residents will be selected by U. S. Civil Service examination. Details on the residencies and how to apply for them are contained in U.S. Civil Service Commission Announcement 97B, Examination for Residency in Hospital Pharmacy, which is available at any post office.

AFPE meets. Howard B. Fonda, Senior Vice President, Burroughs Wellcome & Co. (U.S.A.) Inc., was re-elected President of the American Foundation for Pharmaceutical Education at the 16th Annual Meeting of the Foundation held March 6, 1958, at the University Club, New York, New York.

Charles D. Doerr, Vice President, McKesson & Robbins, Inc., was elected Vice President.

John J. Toohy, General Manager, E. R. Squibb & Sons, Division of Olin Mathieson Chemical Corporation, was re-elected Treasurer; James F. Hoge, Rogers, Hoge & Hills, was re-elected Counsel, and W. Paul Briggs was re-elected Secretary. L. D. Barney, President, Hoffman-La Roche Inc., was elected chairman of the Finance Committee.

C. S. Beardsley, Chairman of the Board, Miles Laboratories, Inc.; John G. Bill, President, Merck Sharp & Dohme, Division of Merck & Co., Inc.; F. S. Dickinson, Jr., President, Becton, Dickinson and Com-

pany; Charles D. Doerr, Vice President, McKesson & Robbins, Inc.; J. Preston Levis, Chairman of the Board, Owens-Illinois Glass Company, and Eli Lilly, Chairman of the Board, Eli Lilly and Company, were re-elected directors. Carl K. Raiser, Director of Distribution, Smith, Kline & French Laboratories, was elected a director.

Robert Lincoln McNeil, Founder, McNeil Laboratories, Inc., was re-elected a member of the Board of Grants. Other members of the Board of Grants are: Chairman, Dr. Ernest Little, Dean Emeritus, Rutgers University; Dr. A. J. Brumbaugh, former President, Shimer College; Dr. Daniel Z. Gibson, President, Washington College ;and Charles J. Lynn, Vice President, Eli Lilly and Company.

L. D. Barney, President, Hoffman-La Roche, Inc.; C. S. Beardsley, Chairman of the Board, Miles Laboratories, Inc.; Richard A. Deno, Professor, University of Michigan; H. A. B. Dunning, Chairman of the Board, Hynson, Westcott and Dunning, Inc.; Harry J. Loynd, President, Parke, Davis & Company; Hugo H. Schaefer, Dean Emeritus, Brooklyn College of Pharmacy; Robert L. Swain, Editor, Topics Publishing Company; and C. R. Walgreen, Jr., President, Walgreen Drug Stores, were re-elected members of the Executive Committee, serving with the Officers of the Foundation.

A budget of $254,000 was approved by the Board of Directors in support of the educational projects of the Foundation for 1958-59.

The Foundation has provided over 1,500 undergraduate scholarships in colleges of pharmacy. During the last academic year, the Foundation provided undergraduate scholarship awards in fifty-three colleges for 146 pharmacy students.

It has supported the Ph.D. studies of 394 graduate students in pharmacy and related fields, and is currently maintaining sixty-nine graduate Fellowships in twenty-three universities. One hundred seventy-five Foundation Fellows are now teaching in seventy-four colleges of pharmacy, and ninety-three Fellows are engaged in research and development work with fifty-three manufacturing chemical and pharmaceutical firms.

The Foundation also supports the American Council on Pharmaceutical Education, annual Teachers' Seminars, and the *American Journal of Pharmaceutical Education.*

It administers the E. L. Newcomb Memorial Awards; the S. B. Penick, E. Mead Johnson, Charles R. Walgreen, H. A. B. Dunning, and J. K. Lilly Memorial Fellowships; and the Gustavus A. Pfeiffer Post-doctoral Memorial Research Fellowships.

In his report to the Board, President Fonda said that, in just the last four years, AFPE has contributed over one million dollars, provided by the drug trade and industry, to strengthen pharmaceutical education. He urged increased Foundation and individual company support to achieve adequate pharmacy student enrollments. As one objective for 1958, President Fonda said the Foundation will seek to add 100 new patrons to its present list of nearly 200 annual supporters.

Rhode Island visiting scholars. A new "Program for Visiting Scholars" has been organized at the University of Rhode Island. Eight visits have been scheduled for the spring semester, starting with Dr. J. George Harrar, Director of Agriculture of the Division of Natural Sciences and Agriculture of the Rockefeller Foundation. He will speak at a special convocation of the College of Agriculture on "Our Agricultural Programs in Foreign Countries," and confer with students and faculty at group meetings. Dr. Harold P. Klein, Chairman of the Brandeis University Department of Biology, will conduct a series of consultations with faculty members, lead a colloquium on "The Role of Biochemistry in Biological and Chemical Research," and give a formal public lecture on "Cellular Biochemistry and Growth." M. B. Naidoo, Vice Principal of Sastri College of Durban, South Africa, who is currently a visiting lecturer at the New Jersey State Teachers College in Trenton, will speak in several classes, consult with members of the departments of geography, economics, geology, and sociology, and give a public lecture. Dr. Seymour E. Harris, Editor of the *Review of Economics and Statistics* since 1943., and Associate Editor of the *Quarterly Journal of Economics* since 1947, will speak on "The New England Economy" on April 21. A member of the Harvard faculty, he has been consultant to the President's Council of Economic Advisers, and was economic adviser to the vice chairman of the War Production Board. Dr. Harvey J. Carman of Columbia University will spend May 1 and May 2 at Kingston. Now dean-emeritus, he was for many years professor of history at Columbia, and since 1939 was assistant and dean. Dr. Walter H. Hartung, Professor of Pharmaceutical Chemistry at Virginia Medical College, will be the visiting scholar May 6, and Dr. Max Lerner, Dean of the Brandeis University Graduate School, and professor of American civilization and political institutions, will be at Kingston, May 14.

BOOK REVIEWS

The Terpenes, Volume V, Sir John Simonsen and W. C. J. Ross. Cambridge University Press, London, England, 1957. 662 pp. $15.50.

Providence was kind in allowing sufficient time for the late Sir John Simonsen to compile the extensive material which constitutes Volume V of *The Terpenes,* thus completing the series. We can thrill at the great feeling of satisfaction which must have come to one of the most outstanding of contemporary organic chemists when he realized that all but the mechanics of his monumental work had been completed. Sir John died while this volume was in proof. We who are the beneficiaries of the legacy sincerely hope that the very able co-author, W. C. J. Ross, will continue to build on this massive foundation a vast superstructure in the chemistry of the terpenes.

This book is set up in the excellent physical form which is characteristic of the entire series. Literally hundreds of structural formulae supplementing the printed word are faithfully reproduced in very clean pattern. Subject matter is extensively documented with references at the foot of each page. On those pages where references are numerous, the symbols used in identification are quite similar, and the reader must observe them with care, lest he make a mistake. This is especially true on page 115, where there are 19 references. Fortunately, this possibility does not occur unduly often.

This volume offers three distinct categories of subject matter. The first part (427 pages) represents a comprehensive digest of the detailed chemistry of hydroxy acids, hydroxy lactones, hydroxy-aldehydo acids, and hydroxyketo acids, all of the triterpene series. Wherever possible, these are treated in a very systematic manner based on their structural relationships, except in those instances where the acids are of unknown constitution. Here, the reader will find extensive data on the physical and chemical properties of the triterpene acids and their derivatives, along with intensive digests of proof for known structures.

A second portion is devoted to the stereochemistry of the triterpenes. In this the organic chemist will find a wealth of material which can be translated and applied in principle as well as in fact to his study of the steroids where the stereochemistry of the fused cycles is amplified by various orientations in the side chains. This section of seventy-six pages closes with an interpretation of the method of molecular rotation differences as it applies to the study of the triterpenes and steroids.

The third part of this volume is an addendum to Volume III which was published in 1951. Extensive research conducted recently among the sesquiterpenes and diterpenes in general, and among the azulenes in particular, has been coordinated by the authors in this section of 113 pages.

With due respect for the success of earlier investigators, it might be said that the study of the terpenes has recently matured, as the logical result of the application of the most modern techniques to elucidating the complex structures of these natural products. Even as Volume V becomes available, it is at least a year behind current literature, but the problem is understandable because of the rapid rate of progress in this area of chemistry and the time required for preparing manuscript and setting up type for publication. As time passes, this series becomes of increasing importance, and it is sincerely hoped that Dr. Ross will continue to prepare addenda so that when the accumulation becomes adequate we might look forward to the announcement of Volume VI of *The Terpenes.*

This is strictly a reference book whose value will be recognized immediately by any modern student of advanced organic chemistry.

Paul J. Jannke
University of Connecticut

Drugs, Their Nature, Action and Use, Harry Beckman. W. B. Saunders Co., Philadelphia, Pennsylvania, 1958. xvii + 728 pp., 126 figs., 11 tbls., 2 charts. $15.00.

"How I wish that pharmacology were as pure as some of the other sciences so that one could be dogmatic with impunity!" Thus Dr. Beckman introduces his discussion of mechanism of drug hypersensitivity, and the reviewer introduces an author who has contributed an outstanding publication in the field of pharmacology. Unlike a number of authors, Dr. Beckman has stripped his text of the usual inconsistencies encountered in explanation of drug action, experimental and clinical. In this approach, the author avoids the usual encyclopedic nature of standard reference and textbooks in pharmacology and presents a well-documented but simplified account of the nature, action, and uses of drugs in therapy. This does not imply an oversimplification, since the book is writ-

ten from the authoritative viewpoint of a clinician well grounded in basic pharmacology.

The organization of the book departs from the traditional practice. The text is divided into three main sections. The first is entitled, "A Justification of Pharmacology and Pharmacologists"; the second, "The Nature of Drugs"; and the third, "The Action and Uses of Drugs." The former sections are brief but complete; the latter represents the bulk of the book and consists of sixty-six chapters divided into thirteen principal categories of anatomical and pathological units rather than on the basis of pharmacological and/or chemical units. Individual chapters are divided into the following main headings: source, nature and preparations; clinical effects; nature of action; absorption, metabolism, fate and excretion; dosage; tolerance; side actions, toxicity and contraindications; and antidotal drugs. Each chapter is followed by extensive references, most of which represent recent research and evaluation of drugs discussed in the chapter. Numerous figures and tables enable the reader to follow text description without difficulty. In addition to figures and tables in the text, "A Chart of the Infectious Diseases with the Pharmacologic Agent Preferred in Each" is presented on the inside front and back covers. The book is well indexed and cross indexed.

The author assumes a previous knowledge of anatomy and physiology, and, consequently, has eliminated detailed descriptions of anatomical and physiological systems except in those cases where a consideration of them is necessary for the understanding of the drug action. This feature is somewhat unique in pharmacological treatises, and despite the exclusion of this information, which is, or should be, essentially review for the student of pharmacology, one can gain a thorough appreciation and understanding of drug action and use. As previously indicated, the book emphasizes clinical human pharmacology.

There is little doubt about the value of Dr. Beckman's book as a text or reference. It is recommended for use in an introductory course in pharmacology because of its simplicity, or it could be easily adapted for use in a course in therapeutics following a more fundamental and basic presentation of pharmacology. Although prefaced by the remark that the book is intended for the undergraduate medical student, it is the opinion of the reviewer that it is an equally acceptable text for students of pharmacy. The numerous references and succinct, clear style of writing make this a valuable text or reference for all students and practitioners of the health professions.

John G. Adams
Duquesne University

A Survey of State Pharmacy Laws, John M. Seus. American Pharmaceutical Association, Washington 7, D.C. vi + 112 pp., 63 appendices. $3.00 (paper).

One of the purposes of the National Drug Trade Conference, which sponsored this paper-bound publication, is to foster uniform state legislation governing the practice of pharmacy. This book covers the pharmacy laws about which there is the greatest misunderstanding, those laws concerned with the "Patent and Proprietary Remedies" and the general class of home remedies.

The "Conference" appointed John M. Seus to study the laws of the states with regard to definitions of the many terms applied to the type of remedies, the restrictions placed on the sales, any regulations promulgated by the boards, and the powers of the boards to enforce the statutes and regulations.

There are three chapters. The first deals with state statutes as to the sale of "Patent or Proprietary Medicines," "Home Medicines," "Domestic Remedies," dispensing of drugs in villages and rural areas, powers granted to the state boards in general, and the power to add to or revise the list of drugs and medicines concerned in this study.

The second chapter deals with the power exercised by the boards of pharmacy, the third with decisions of the courts as to the definitions, sales, and related matters.

The sixty-three appendices classify statutes as to complexity of definitions, restrictions of sales, sale of poisonous and nonpoisonous drugs, and other provisions of the laws and regulations of the forty-eight states, the Territory of Alaska, and the District of Columbia.

The purpose of the study has been adequately accomplished. The facts included can now be given further study and perhaps some agreement reached as to the type of legislation which would best serve to guard public health and be fair to the drug industry. A review of the Survey points out that it is still an enormous task to arrive at any suggested uniform legislation for the states to consider. This booklet might possibly be used as a reference for a course in pharmacy law.

Haakon Bang
State College of Washington

Biochemistry and Human Metabolism, Burnham S. Walker, William C. Boyd and Isaac Asimov. Third Edition. The Williams and Wilkins Company, Baltimore, Maryland, 1957. v + 937 pp. $12.00.

This edition of *Biochemistry and Human Metabolism* is the second revision of a textbook which appears to have established itself firmly among the educators in the field of human biochemistry. The format

of the book differs somewhat from most textbooks of biochemistry being divided into five broad divisions or parts, namely: "Structure," "Control," "Growth," "Metabolism," and "Pathology." These divisions are followed by an appendix on isotopes. Part I introduces the reader to the structural components and organization of the body tissues with a discussion of amino acids, proteins, protein structure, carbohydrates, lipids, tissue chemistry, blood, and anemias. Enzymes and coenzymes, enzymes and enzyme systems, and hormones comprise Part II. Part III discusses the subjects of nucleoproteins and growth, cancer, as well as reproduction and heredity. Part IV, the largest division in the textbook, deals with the rapidly unfolding field of metabolism and includes chapters on food and diet, digestion carbohydrate, protein and lipid metabolism including the abnormal metabolism involved in diabetes, starvation, and ketosis. The following chapters in this section include electrolytes and water, respiration and acidosis, heat and work, as well as a chapter on excretion and some of its disturbances. Part V is devoted to the vitamins, vitamin deficiency diseases, and infection. The appendix gives a brief outline of isotopes and their use in the study of biochemistry.

The general structure of this revised edition has been altered from that of its predecessor only in minor ways. The chapter on "Tissue Chemistry" in the previous edition has been subdivided into two separate chapters, "Carbohydrates and Lipids" and "Tissue Chemistry." Similarily the chapter on "Enzymes" is now divided into two chapters "Enzymes and Coenzymes" and "Enzymes and Enzyme Systems." The main effort of the revision is, as the authors express it ". . . to keep the text as nearly abreast of the field as is humanly possible." To this end the authors have expanded the content adding newer material in many sections and also rewriting older material for the sake of clarity and for incorporation of newer concepts.

The book is well organized and is written in a clear and concise manner. Although the material included is probably too extensive to cover in a two semester course in biochemistry, the book is arranged in such a manner that complete sections such as those on genetics, blood grouping, and immunology may be omitted if desired. Such omissions would not seriously interfere with the students' understanding of the general biochemical processes of the body. Because of the large amount of theoretical material which must be included in the book, it is the reviewer's belief that the space devoted to the qualitative and quantitative determinations of proteins and amino acids could be reduced or omitted. Similarly, the appendix on isotopes does not appear to be essential in a textbook of this nature.

The student of pharmacy should find this book valuable since emphasis is placed upon the relationship between the biochemical processes of the body and their application in medical practice. *Biochemistry and Human Metabolism* is recommended as a reference book in all pharmacy libraries, and it deserves consideration as a biochemistry textbook for pharmacy students.

Carman A. Bliss
University of Southern California

The Appraisal of Applicants to Medical Schools, Helen Hoter Gee and John T. Cowles, Editors. Association of American Medical Colleges, Evanston, Illinois, 1957. xix + 228 pp., 124 tbls. $3.00 cloth, $2.00 paper.

The fourth Teaching Institute of the Association of American Medical Colleges, held in November, 1956, was devoted to "evaluation of the student," with results as reported in this publication. Participants in the Institute numbered 132, and included many nonmedical educational experts, especially psychologists, as well as teachers and administrators from ninety-five medical schools in the United States and Canada.

The first and fourth parts of the report were more interesting to me than was the filling, and I believe the first part, on origins and characteristics of professional students, and the fourth, on over-all appraisal of the admissions process, will be more useful to teachers and administrators in colleges of pharmacy than will the two parts on the intellectual and the nonintellectual characteristics of applicants. Next to character and integrity (classed as nonintellectual characteristics), intellectual characteristics (as measured by standard tests) and academic achievement are rated of highest importance in evaluating applicants. The last-named qualities are rated at the top in estimates of confidence that can be placed in evaluations.

Consensus of presentations on nonintellectual characteristics was that they are of great importance, but that no, or almost no, reliable criteria exist for their evaluation. The interview as a tool for selection was considered to be especially overrated by many administrators.

The last paper is a report on a study of multiple criteria, evaluated in a single medical school in relationship to performance of the medical student during his four years of study. A by-product of this study is the rather shocking statement of a distinguished psychologist who helped to plan the study: "All of the evidence available to us leads to the conclusion that the *typical* young physician has little interest in cultural aspects of the society in which he lives, has very little sensitivity to or feeling for the needs of the community, and is generally not inclined to participate in

community activities unless these contribute to his income." What would this man say of pharmacy, following a comparable study of students in this field?

At the moment, pharmacy is not faced with the problem of selecting a limited number of students from a large number of applicants. It may be in the future. The findings of this conference might save pharmacy much wasted motion at a later date, and should be of academic interest now to anyone concerned with the quality of students admitted to the study of any health profession.

Richard A. Deno
University of Michigan

Handbook of Toxicology, Volume II: Antibiotics, William S. Spector, Editor. W. B. Saunders Company, Philadelphia, Pennsylvania, 1957. xii + 264 pp. $6.00.

This second volume of a projected series of handbooks on toxicology follows Volume I by a period of little more than a year. Again, as with the previous volume, we have a handbook representing much time and work by a considerable number of compilers. Principal contributors are Dr. John N. Porter and Mr. G. C. De Mellos, together with eighteen other authorities in the field representing the American drug industries, governmental services of the United States and Japan, and university and hospital services in the United States, Canada, and France.

The format of this volume is of similar design to previous handbooks in that the data are listed in concise uniform outline which allows for rapid availability of desired information. Monographs for 340 antibiotics are presented with a total of approximately 2,500 references to the literature. Data regarding each antibiotic vary as to its current importance and literature prominence. Most monographs list source, nature, stability, solubility, biological activity, and/or acute toxicity. Antibiotics such as penicillin are complete with molecular weight structure, crystal form, melting point, optical activity, quantitative determination, clinical usage, resistance, absorption and excretion, mode of action, etc.

As the principal contributors state, the material presented represented at the time of publication, the most authentic, valid, and nearly comprehensive survey possible of the field of antibiotics. The criterion used for inclusion as an antibiotic is that the material must have been produced by a microorganism and be capable of inhibiting or destroying microorganisms in dilute concentration. From an academic viewpoint this definition is quite simple and naive although practically it is perhaps necessary. Interpretation of this definition might explain certain deletions from this antibiotic list. Substances which affect microorganisms and/or other forms of life not interpreted as fitting the requirements of this definition are to be presented in a forthcoming volume entitled *Anti-Infectives.*

The volume is well indexed with references to other names, official, chemical, and/or generic. Also contained are two appendices: I, "Antibiotic Efficacy" and II, "Antibiotic Sources," both of which are based on an alphabetical listing by the organism. As indicated before, the book contains an excellent bibliography with as many as 176 references for a certain antibiotic. Some antibiotics such as the penicillins and the streptomycins are referenced to monographs and/or books plus a selected number of articles.

To the reviewer the usefulness of this handbook lies not only in the aspects of strict toxicology but also as a reference to many other properties of a large number of relatively unknown antibiotics. Its coverage is sufficiently complete that the title of the book might well have been a handbook of antibiotics with no specific reference to toxicological problems.

The handbook is a must as a reference in all libraries and for those individuals doing research in this field. It might well be considered as a text or an additional reference in a course in antibiotics. The inclusion of chemical, physical, and biological properties of these various antibiotics makes this book a good reference to the field, particularly at the very reasonable price. The Committee on Handbook of Biological Data, The Aero-Medical Laboratory, Army Chemical Center, Editor William Spector, their assistants, committees, and contributors are to be commended for undertaking this series of handbooks. Financial support by a number of federal agencies has allowed a book which otherwise might be prohibitive in cost.

Donald C. Kroeger
University of Texas

A Textbook of Pharmacognosy, George Edward Trease. Seventh Edition. Williams and Wilkins Company, Baltimore, Maryland, 1957. viii + 808 pp., 256 figs. $8.50.

The five sections of this textbook are: 1. "General Principles," 2. "Drugs of Vegetable Origin," 3. "Drugs of Animal Origin," 4. "Chemistry," 5. "Microscopy." An appendix on biological sources and pharmacopeias is a phylogenetic listing of the principal vegetable drugs and some official works which include these drugs. This appendix is not included in the index.

A chapter on tracer technology has been incorporated in the section on chemistry. Assay procedures, autoradiography, and pharmacognostical applications of radioactive isotopes are briefly discussed.

There are other features wherein this work goes beyond the scope adopted by current U.S. textbooks of pharmacognosy. One of these is the inclusion of French,

German, and Spanish synonyms. However, these synonyms are not indexed. A useful chapter on morphological classification and systematic description of drugs offers a concise summary of organography.

Chapters on extraction of drugs, fluorescence analysis, and chromatographic analysis in the chemistry section and practically the whole of section five, on microscopy, are excellent presentations of topics and aspects not as adequately treated in our contemporary textbooks.

There are references to the literature following the discussion of many of the individual drugs and at the ends of chapters.

This book was prepared primarily for British and Commonwealth students, and some shortcomings from this reviewer's position may not be completely valid. The omission of endocrine products, of bacterial products and venins, and the inclusion of items such as musk, lac, leeches, for example, bespeaks a regrettable imbalance. The placing of hyaluronidase, pepsin, thrombin, etc. in a chapter under general principles seems unfortunate. Many of the photographic figures lack desirable sharpness.

It is a desirable addition to the library where students of pharmacognosy can utilize it with profit.

J. Hampton Hoch
Medical College of South Carolina

The Relation of Psychiatry to Pharmacology, Abraham Wikler. The Williams & Wilkins Co., Baltimore, Maryland, 1957. viii + 322 pp. $4.00.

This book is actually a large review article which was originally intended for publication in *Pharmacological Reviews.* Dr. Wikler cites 889 references which require forty pages for their listing.

Section 1 of the book considers the effects of drugs on human behavior, while Section 2 takes up theories and mechanisms of drug actions. Under "therapeutic procedures," in Section 1, are discussed: the production of coma by drugs, "psychoexploration," drugs used for tranquillization, and drugs used to cause arousal and elevation of mood. These are followed by drugs used for diagnostic and prognostic testing procedures, and those used to produce "model" psychoses. In the second section, these same drugs are reviewed with regard to their mechanisms of action, or theories pertaining thereto, as inferred from results in three different disciplinary fields of experimentation. It would seem that each of these drugs may have a biochemical mechanism, a neurophysiological mechanism, and a psychological mechanism of action. This helps to promote the maintenance of an "open mind" by the reader. The author's meaning is expressed, in part, by his own words in the following question: "To what degree and in what manner can the changes which drugs produce in human behavior be correlated with the changes which such agents effect in (i) cerebral metabolism; (ii) neaural organization; and (iii) environmental adaptation?" The old concepts that drugs which affect behavior may act on definite individual loci or "centers" in the central nervous system seem to be giving way to theories that such drugs may exert effects on many loci in the nervous system, simultaneously. In fact, they may often act, it would seem, by facilitating or inhibiting synaptic transmission in multisynaptic neural pathways. One cannot avoid being impressed by the apparent complexity of the central nervous system, the somewhat less than perfect understanding of its functioning; and the very numerous variables, both known and unknown, which may affect human behavior. The reader is likely to infer from this review that many years of careful research may be required to elucidate the exact mechanisms by which drugs influence human behavior. Some drugs appear to produce grossly different effects in people suffering from different types of mental illness, and these effects may differ, in turn, from those elicited in average healthy individuals. Therefore, it may be necessary to learn much more about the fundamental abnormal processes which characterize mental illnesses before the modes of action of therapeutic measures can be really comprehended. Of course the increased use of drugs as "tools," and also for the production of "model psychoses," may continue to contribute to our knowledge concerning the nature of human psychoses and neuroses. Dr. Wikler states that "the relation of psychiatry to pharmacology may be epitomized as a joint effort in the search for 'pattern specificity' in the actions of drugs, since the existence of such 'specificities,' however complex their patterns may be, implies the existence of 'common denominators' upon which they act, and which are, in turn, among the variables that determine human behavior." For the detection and use of these "common denominators," there must be better "communication and transaction" between psychiatrists and pharmacologists than that which currently exists.

Dr. Wikler's review of the literature is very comprehensive and should stimulate the minds of its readers. The vast variety of experiments reported, and the number and diversity of methods of experimental approach to problems were particularly impressive to this reviewer. The long list of up-to-date references is valuable to investigators and would, in itself, make this book a very worthwhile addition to the library of every pharmacology department and every school of pharmacy.

John Emerson Davis
University of Texas

Adventures in Medical Education, G. Canby Robinson. First Edition. Harvard University Press, Cambridge, Massachusetts, 1957. xii + 338 pp., 9 plates. $5.00.

This book begins with a brief historical account of the origins and early days of medical education in this country up to the year 1899, when its author entered the Johns Hopkins Medical School. Thereafter, the book is an autobiographical account of the progress of American medical education as the author saw it and as he contributed to it. Following his early years at the Hopkins he went for clinical training to Pennsylvania Hospital in Philadelphia and then to Munich for a year under Professor Fredrick Muller, then the foremost professor of medicine in Germany. Other chapters are histories of the institutions with which the author served, and which he helped build in his long career in medical teaching and administration. He describes the founding of the Hospital of the Rockefeller Institute, the first hospital devoted primarily to medical research on this continent. Then follow chapters on the Washington University School of Medicine and the schools of medicine of Vanderbilt, Cornell, and finally Peiping Union Medical College. The book concludes with a chapter on the social aspects of medicine and a summary of a half-century's progress in medical education.

This book is worth the attention of students in any profession, but it is particularly interesting to those who teach in professional schools. The reader is confronted again with some facts that as a teacher he may already know, but which he may be inclined to forget or to ignore:

First, there is such a thing as inspirational teaching. Ostler, Welch, Halstead, and Kelly were remarkable teachers, yet each was very different from all the others. They often seemed to use opposite methods, but all got similar results. The feature common to all was an enthusiasm for learning and for teaching itself.

Second, enthusiasm for learning and for teaching is transmissible. Great teaching makes great teachers. A surprisingly high percentage of the students of the Big Four at the Hopkins became renowned medical educators.

Third, as one reads the history of the establishment of centers of medical education, one is struck by the fact that what rapidly became large and respected institutions were conceived, founded, and built by a very few, sometimes by only one or two, men of unusual vision and energy. Too often in viewing the past we feel that accomplishment was great because the time was ripe for accomplishment. Dr. Robinson shows us quite clearly that it was the men who made the times, rather than the times that made the men.

Fourth, the reader is struck by the emphasis in the early days that was put on the necessity for a broad classical education as a prerequisite for specialized professional training. A physician was expected to be educated as well as trained. I wonder if the most serious mistake we make in present day professional education is that we ignore the need for breadth of understanding and general refinement of intellect in concentrating on cultivating technical excellence in our students.

R. A. Lymm, Jr.
Idaho State College

Manual of Pharmaceutical Law, William Pettit. Second Edition. The Macmillan Company, New York, 1957. ix + 303 pp., 6 tbls. $4.50.

The author has compiled in book form what might be considered 188 pages of lecture material in an easily read free style, legally correct as annotated, and freely salted with case studies. To these have been added another ninety-five pages of statutes, an incomplete glossary of terms, and an effective index.

Perhaps the greatest asset of the book is the successful attempt to keep the contents at the undergraduate level of interest and understanding. This is particularly appreciated in the case presentations which state the nature of the violations and the court decisions along with any necessary explanations. Such procedure compares favorably with the other available jurisprudence text which is practically all case material in a form oftentimes beyond student comprehension, interest, and need.

The eight chapters begin with a short review of governmental rights to regulate pharmacy at all levels of government and all facets of pharmacy. The requirements for pharmacist and store registration are then discussed in detail with 1955 NABP report tables adding greatly to the potential for student-teacher exchanges relative to original and reciprocal registration and store licensing in the various states. Consideration of nonpharmacist drug distribution includes both outlets and merchandise.

The control of narcotics is detailed from international to state levels and is inclusive of recent regulations relevant to oral prescriptions. A map of international operations and a flow sheet of major divisions of the Treasury Department of the U.S. government add to understanding.

General considerations of the food and drug laws include a flow chart of the major divisions of the Department of Health, Education and Welfare. The Sullivan Decision, adulteration, misbranding, current dispensing amendments, factory inspection, labeling exemptions, biological laws, and manufacturers' laws are reviewed at both federal and state levels.

The first four chapters as described above represent the best and most detailed contributions of the text. The remaining four chapters constitute a general survey of a great number of laws wth some special emphasis on such items as poisons, barbiturates, contracts of sales and operation, tort violations centered around negligence, and various laws pertaining to business operation. The discussions range from one-third page to three pages, are interesting and factual in detail, but oftentimes are too brief to be of real value other than to indicate that such a regulation exists. However, such presentation permits the teacher or reader to drop or to further explore any given subject as occasion dictates.

The inclusion of important statutes as an appendix is a valuable addition and does not interrupt the running context to confuse the reader. The acts may be used or omitted as desired. The value of the model state narcotic act and of the entire fifteen-page section on foods in the FD&C Act is questionable in the interest of space value and pharmacy needs. Except for a brief statement concerning the Federal Trade Commission Act in the last chapter, there is no reference by name or information to the anti-trust laws which play so important a part in current retail-wholesale-manufacturer structure relevant to competitive practices.

This book has value, with the exceptions noted, as a text for a two-hour jurisprudence course, and also for a three-hour course if supplemented with other material. Three or four review questions are added to each chapter, but their value is questionable in that they are too few in number, they do not always constitute a real review of the information pertinent to the practice of pharmacy, and they do not stimulate thought study in depth.

This book should be a part of both college and retail pharmacy library for reference purposes relative to the major federal laws and certain state laws. Its value in any single state is limited by the generalizations on the laws of all forty-eight states as must be for a book on a subject of such difficult and diversified content as pharmaceutical law.

Robert V. Evanson
Purdue University

Industrial Toxicology, Lawrence T. Fairhall. Williams and Wilkins Company, Baltimore, Maryland, 1957. xii + 376 pp., 4 tbls. $10.00.

This text presents the direct toxic effects of industrial poisons in a clear and concise manner. The products included are separated into two major categories—"Inorganic Substances" and "Carbon Compounds." Alphabetical arrangement of specific compounds within these categories facilitates the location of data. The introduction provides a succinct discussion relating to the general principles of industrial and experimental toxicology, thus enabling the inexperienced reader better to understand and appreciate the subject matter presented in the individual monographs. Each monograph presents important physical and chemical characteristics, industrial uses, toxicity, and methods for the analytical determination of the compound being considered. An outstanding feature of this book is the adequate and up-to-date bibliography, relating to more specific information, which concludes the discussion of each compound. The text lucidly summarizes the hazards involved but does not attempt to outline preventive or antidotal measures for the toxic agents included. The author has commendably included not only the classical aspects of industrial poisoning but also provides good coverage of the concepts of inhalation toxicity and air pollution, an indication of the timely nature of the subject-matter presentation.

Industrial Toxicology should be of value primarily to those specifically involved in the general topic indicated by the title, and to those persons who may encounter problems relating to the subject. In this respect, the reviewer believes it to be superior to related manuals in this field. The book is best suited for use as a convenient "desk reference" for concise information relating to the toxicity of industrial materials rather than the commonly employed medicinal agents.

G. Victor Rossi
Philadelphia College of Pharmacy and Science

Pharmacological Principles of Medical Practice, John C. Krantz, Jr., and C. Jelleff Carr. Fourth Edition. The Williams and Wilkins Company, Baltimore, Maryland, 1958. xi + 1313 pp., 26 annotated pictures of eminent investigators, 71 figs., 4 plates, 51 tbls. $14.00.

The news that after only four years the authors have again thoroughly revised this popular pharmacology text is welcome. Valiant efforts to avoid an inconveniently bulky book have been made by using smaller type for the chemical formulas and for part of the text, by reducing the number of figures and tables and by omitting lists of these, by deleting outmoded drugs such as the sulfone hypnotics, and by referring to material in previous editions, such as the use of urethane in leukemia treatment. However, to bring the text into conformity with the latest official compendia, to present numerous recent pharmacological findings, to reveal newer concepts of enzymic mechanisms of action, to add chapters on "Use of Drugs in the Treatment of Mental Illness" and "The Local Use of Drugs in the Ear, Eye, Nose and Throat" and to enlarge the chapter

on epilepsy to include other hyperkinetic states has increased the text material by 130 pages. The figures and tables are now numbered according to chapter numbers. To indicate the scope of changes, one may mention new material on emotional factors and biochemical individuality, cautions on routine mineral oil medication, treatment of chronic alcoholism, arrhythmia with cyclopropane, balanced anesthesia, newer intravenous anesthetics, future of hypothermia anesthesia, nalorphine usage, aspirin versus corticosteroids in rheumatism, and the current controversy on tobacco smoking in relation to bronchogenic cancer.

Many new references have been added to the lists, and others, especially those of 1957, have been incorporated into the text. However, work published in the *J. A.Ph.A., Scientific Section*, is emphasized only in the case of the antacids (page 392). As in previous editions, the mutual beneficial relationship between the physician and the pharmacist is stressed, and a concise physiological, clinical, or historical setting introduces each chapter; fourteen of the chapters have had major aspects checked by specialists, and lists of official U.S.A. and British preparations are appended. Toxicology is included only in relation to medicines; hence, information on such poisons as carbon monoxide and cyanides must be sought elsewhere.

The reviewer wishes to suggest certain corrections and changes, referring others directly to the authors. Page 415, line 6: a "concentration in the urine (of alcohol) 3-fold that in the venous blood" is far above the commonly given average value of one-third higher. On page 682, line 4, it would seem safer to administer an anesthetic prior to gastric lavage lest passing of a stomach tube in strychnine poisoning induce convulsions. Typographical errors occur in page references on three pages as follows: on page 687 the first (p. 000) should read (p. 1026), the second (p. 1024); on page 688 (p. 000) should read (p. 740); and, on page 706 p. 000 should read p. 614. Page 1172, line 5: delete "on the thyroid gland."

The timely appearance of this comprehensive revision will greatly aid all teachers, researchers, and students in pharmacology and associated fields in following recent trends in the employment of medicinal agents. It should continue to serve well as a text in our colleges of pharmacy.

Harald G. O. Holck
University of Nebraska

Metabolic Aspects of Transport Across Cell Membranes, O. R. Murphy, Editor. University of Wisconsin Press, Madison, Wisconsin, 1957. xxiv + 379 pp., 134 figs., 11 plates. $7.50.

The proceedings of a symposium on membrane transport held at the University of Wisconsin in August, 1955, are published in the volume: *Metabolic Aspects of Transport Across Cell Membranes*. The book contains sixteen sections, ten of which represent the formal papers, each by a recognized authority, presented at the symposium. This portion of the book covers the fundamental aspects of ion transport in cells of nerve, muscle, and cardiac tissue; transport and related phenomena in the stomach, intestines, and kidney; and regulation of fluid exchange in the body. Some of the clinical implications of ion exchange are also presented. Six panel discussions are recorded; they are concerned with the general topics of the formal papers and record a variety of opinions and experiences on each topic.

The list of twenty-two symposium participants includes the names of such outstanding scientists as E. J. Conway of Ireland, H. H. Ussing of Denmark, S. Weidmann of Switzerland, in addition to H. W. Davenport, W. O. Fenn, R. W. Gerard, R. F. Pitts, A. M. Shanes, and others from the United States.

Topics discussed at the symposium constitute one of the most exciting phases of present-day biologic research. Phenomena occurring intracellularly and the mechanisms of transport across the cell membrane have challenged scientists for many years. However, until very recent times, technical problems have been of such magnitude as to impose severe limitations on expansion of our knowledge of cellular mechanisms. In recent years, isotope techniques, intracellular electrodes, and electronic recording, and other devices have brought remarkable technical advances to the field and, as Ussing says, "have set the limits of our knowledge moving."

To prepare a critique of the contents of a publication of this nature would be beyond the purview of most people, and the reviewer is in no way disposed to attempt a critical analysis. Several comments, however, seem appropriate. *First*, Ussing's discussion of the principles of membrane transport and that of Conway on membrane equilibrium in skeletal muscle and the active transport of sodium are particularly worthy because they deal with the fundamental considerations: concentration and electrical gradients, passive and active transport, ionic currents, energy sources, etc. *Second*, Conway's defense of his theory of electrolyte exchange is both vigorous and scholarly. Only occasionally does one sense such intensity of feeling over opposing theories as is evident in the manner in which Conway challenged and attacked the Ling fixed-charge hypothesis. *Third*, Weidmann's discussion of transport across cardiac membranes, although brief, is authoritatively written. This section of the book is somewhat overshadowed by a publication of the New York Academy of Science

(*The Electrophysiology of the Heart*) which appeared in August, 1957.

Such a publication as this is not written as a textbook. It will, however, serve as a useful reference in graduate courses in biochemistry, pharmacology, and physiology. The pharmaceutical chemist who is interested in the mechanics of drug action at the cellular level also will find portions of the book useful. The literature cited in the references is extensive and adds greatly to the value of the book.

The physical aspects of the book are quite acceptable: stock, format, type, printing, binding, plates, and figures. It is regrettable that the proceedings of such an important symposium, held in 1955, could not be made available to others until late in 1957. When specialists are brought together to discuss their contributions to such an important area, every attempt should be made to expedite the publication of their papers and discussions.

Donald C. Brodie
University of California

Morphine and Allied Drugs, A. K. Reynolds and L. O. Randall. University of Toronto Press, Toronto, Canada, 1957. ix + 393 pp., 14 figs., 7 tbls. $10.00.

This book, a pharmacologic monograph, attempts to bring together in a single treatise the pharmacology of morphine, its related alkaloids, derivatives, and substitutes. Emphasis is placed upon the significant research efforts of recent years.

The book is divided into five major parts. Part one, which represents the major portion of the text, emphasizes the pharmacology of morphine and includes as well discussions pertaining to other alkaloids of the morphine group, the morphine derivatives, and other alkaloids of opium. Part two of the book considers the pharmacology of papaveraceous alkaloids most frequently found in species other than *Papaver somniferum*, including alkaloids sometimes classed as the *Corydalis* group and other alkaloids, some of which are of unknown constitution. Part three contains discussions pertaining to the synthetic analgesics. Part four considers antagonists to analgesics and theories relating chemical structure to analgesic activity. Part five briefly summarizes the present status of morophine and allied drugs as analgesics and points to significant recent accomplishments in basic research which should aid future investigators to understand the phenomena of analgesia.

The authors have followed a definite pattern in the presentation of the material. Each subject is introduced with a general discussion based on information which appears to be well established or which represents the bulk of available evidence. These general discussions are followed by more detailed information in instances where points of controversy are indicated.

In the reviewer's opinion several aspects of the monograph make it particularly valuable to the pharmacologist and pharmaceutical chemist. One aspect is the review of recent literature which integrates over 1,700 pertinent bibliographic references including works published in 1956. A second aspect of importance is the emphasis given to species variation observed in response to morphine and allied drugs. A third aspect of the book which is valuable is the inclusion, where applicable, of the chemical name, generic name, code number, and trade name of the compounds.

The structural formulas presented in this compilation, particularly those portraying the synthetic analgesics, are carelessly drawn and therefore detract from the value of the book. If one were not familiar with the chemistry of the field, it would be difficult to determine the actual points of attachment of the various groups to the basic molecular structures.

This monograph will be of value to investigators in the field of analgesics and to instructors and students of pharmacologic chemistry and pharmacology.

Laurence E. Gale
Idaho State College

Food Poisoning, G. M. Dack. Third Edition. The University of Chicago Press, Chicago, Illinois, 1956. xi + 251 pp., 13 tbls. $6.00.

The account of an investigation of a food poisoning outbreak has all the elements of a good detective story. This volume has its fair share of these, and, in addition, it contains information about many other aspects of the subject.

The introductory chapter discusses general investigational procedures. The three major types of food poisoning are next considered in detail. Chemical poisonings (chiefly inorganic) are covered in a single chapter as are poisonous plants and animals. Poisonings by bacteria and their products require more space. *Clostridium botulinum*, the *Staphylococci*, the *Salmonella* and *Streptococcus faecalis* rate individual chapters, and bacteria of lesser importance are grouped in another. The book concludes with a summary of infections which must be differentiated from food poisoning.

The information in each chapter generally includes the following points:

1. Case Histories — Early outbreaks of historical interest are presented and are followed by more recent case histories which establish the typical patterns of circumstances and foods involved.

2. Medical Aspects — These include symptoms, treatment, prognosis, mortality, pathology, etc.

3. Control Measures — The problems of laboratory diagnosis are discussed; experimental work with the growth relationship of bacteria to their environment, and work with experimental poisoning in humans

and animals are evaluated; the bearing of the above on food-handling procedures is summarized.

Much of the material is presented in the form of brief literature abstracts. The chapter references cite publications with dates up to 1955 bearing out the jacket claims for inclusion of the latest research. Material which may be readily found in standard volumes on laboratory methods, etc., has not been included.

In a pharmacy library this book will serve well as supplementary reading for courses in medical microbiology and public health. It expands the subject matter found in the usual texts for both courses, and it is written in a style which the pharmacy student should comprehend easily.

Douglas Johnson
Southern College of Pharmacy

Chemotherapy and the Central Nervous System, Henry McIlwain. First Edition. Little, Brown and Company, Boston, Massachusetts, 1957. viii + 328 pp., 61 figs., 31 tbls., $10.00.

This well-written and well-illustrated book includes chapters on the chemical synthesis of therapeutic agents, general depressants, control of body temperature, the chemotherapeutic system (two chapters), infection (two chapters), epilepsy and anticonvulsants, analgesics, nervous and mental disorders (two chapters), and the nature and results of chemotherapeutic trial. These are followed by author and subject indices.

The book is a natural companion to *Biochemistry and the Central Nervous System* by the same author. Because the approach to chemotherapy here is biochemorphological, in the broader sense of that term, both books should be read for full appreciation.

It is not an easy task to discuss localized drug actions in the central nervous system and not confuse the picture by introducing other actions and other areas of that system. Dr. McIlwain succeeds quite well in that task. One can, however, express mild wonder at his inserting two chapters on "The Chemotherapeutic System" in the middle of an otherwise orderly subject arrangement; these might have served better an an introduction to the general theme. On the other hand, the discussion of general depressants serves quite well in pointing out the complexities of central drug action.

Incorporated into the various chapters is sufficient physiology, biochemistry, pharmacology, and pharmaceutical chemistry to illustrate the interrelationships between these disciplines as they pertain to the actions of drugs, as well as to maintain the interest of specialists in these areas. Only those chemical structures needed to illustrate particular points are shown. Physiological and biochemical principles are well illustrated in the numerous graphs and charts, while pharmacological facts are given in well-designed tables. All discussions are accompanied by extensive references.

Certainly the book compares very favorably with others in this field, and surpasses most in excellence. It should obtain prominence in every pharmacy library, and not only should be read, but should be studied thoroughly by graduate students in both pharmaceutical chemistry and pharmacology. Unfortunately, the subject matter will prove too complex for the majority of undergraduate students.

John F. Bester
University of Southern California

Introduction to Protein Chemistry, Sidney W. Fox and Joseph F. Foster. John Wiley and Sons, Inc., New York, New York, 1957. viii + 459 pp., 68 figs., 42 tbls. $9.50.

The first third of the book is devoted to the amino acids (properties, preparation, assay, and metabolism), followed by three chapters on peptides, four on the physicochemical characterization of proteins, and single chapters on preparation of proteins, protein structure, and denaturation of proteins. There are included next six chapters on groups of proteins of particular biochemical interest (blood proteins, hormones, enzymes, etc.) and a final chapter on the evolutionary origin and biosynthesis of proteins.

This is a textbook, not a monograph, and the authors have made it of appropriate length to serve this function. It is also clearly written and well illustrated. There are, for instance, excellent diagrams to elucidate such relatively difficult sections as the ones on physico-chemical methods for determination of molecular size, shape, electrophoretic mobility, etc. On the grounds of chemical adequacy and coverage of current work, it is a better text than others with which the reviewer is familiar.

The book contains a few inaccuracies and careless statements and a very few typographical errors, but these are usually readily interpreted. A major criticism which the reviewer has is the devotion of one-third of the book to the amino acids. While some of this material is wholly appropriate and essential to the understanding of the later discussions of proteins, a considerable part is of less importance and some almost trivial. If fifty pages could have been saved, they might better have been added to the chapter on enzymes, surely the most interesting and important, as well as the most studied, group of proteins.

Because of the preeminent position of proteins in biochemistry, special courses in the subject are frequently and appropriately offered. For such courses this book

will be a good text. It will also be a convenient reference for students in related courses, or even for research workers desiring an introduction to a particular topic.

Carl M. Stevens
State College of Washington

Inorganic Synthesis, Volume V, Therald Moeller, Editor-in-Chief. McGraw-Hill Book Company, Inc., New York, New York, 1957. xiv + 265 pp., 19 figs., tbls. $6.00.

Inorganic Synthesis, as the name implies, is a presentation of a variety of syntheses of an inorganic nature. The compounds included are of both a fundamental and technical nature. The format, arrangement, and conventions used in this volume are identical to those used in the previous volumes of the series. The subject index and formula index are cumulative for the five volumes of the series.

The presentation of the individual preparation is arranged in the following sequence. The equations for the reactions involved in the synthesis are given first. They are followed by the synthetic procedure, which is lucid and sufficiently detailed for easy reproduction. Essential critical details, frequently omitted in publications, are included. In several cases alternate methods are given. If special glassware or apparatus is needed, a diagram is included. A very valuable feature is the inclusion of cautions in those cases where hazardous procedures or materials are required. Analytical methods are included if distinctive. Each of these synthetic procedures has been completely checked by at least one independent laboratory.

The procedure section of a given synthesis is followed by a compilation of the usual physical properties and the important chemical properties. A list of references closes each presentation. Liberal use is made of cross references. In some cases a brief discussion of background and previous methods of synthesis is included in the monogram to broaden the scope of the treatment.

This book has little, if any, material of interest to the undergraduate courses of the pharmacy program. However, it should prove a valuable addition to the pharmacy library as a reference and source book for the staff and for students on the graduate level.

For those interested in inorganic pharmaceuticals, whether from the point of view of the chemist or pharmacist, there are many compounds included which are of direct interest to pharmacy. The section on chlorine (I) compounds, which includes chlorine (I) oxide, hypochlorous acid, and calcium hypochlorite, is excellent not only for background descriptive chemistry but also for the synthesis of these substances in a purity and concentration not ordinarily obtainable. Some other compounds of interest to such individuals could be titanium (IV) oxide, iron (II) chloride 2-hydrate, cobalt (III) sulfate 18-hydrate, and many complexes of these metals.

Those in the synthetic organic pharmaceutical field will find preparations which have value as adjuncts to their work. Preparations illustrative of these are: sodium hydride, sodium dispersions, cyanogen, and powdered nickel.

Items of possible general interest in pharmacy might be: the preparation of "carrier-free" iodine-131, polyhalogen complex salts, organosilazanes, substituted phosphates and silica gel, to name a few.

In the light of recent interesting applications of what are ordinarily considered unusual or rare inorganic compounds in pharmacy and its related fields, this book can conceivably act as a source book of compounds for screening, leading to possible new pharmaceutical uses of some of the compounds covered, or as a lead to possible similar compounds. Titanium (IV) sulfide, lithium peroxide, and selenium (IV) chloride might be possibilities of this type.

Clarence A. Discher
Rutgers—The State University

Emulsions: Theory and Practice, Paul Becker. Reinhold Publishing Corporation, New York, New York, 1957. ix + 382 pp., 112 figs., 54 tbls. $12.50.

The book, *Emulsions: Theory and Practice* by Paul Becker, is a valuable addition to the limited number of books available which deal in a fundamental manner solely with emulsion systems. The author has presented a rather difficult subject in an interesting and easy to read manner. Also, the book is extremely well illustrated with figures and tables taken from the original literature.

The theories of surface chemistry which are necessary for an understanding of emulsion systems are adequately treated; whereas, the physical properties of these systems and the theories of emulsion stability are thoroughly discussed. Of particular significance is the fact that a mathematical treatment of the subject matter has been included by the author when necessary.

The large and up-to-date bibliography will be particularly useful to the investigator in the field of emulsion technology. Also, the author has briefly described the analytical methods employed in the references cited, and this too will be appreciated by the investigator.

The chapter dealing with emulsion applications is somewhat scanty. This is particularly true for those applications pertaining to pharmaceutical preparations. The applications dealing with cosmetic preparations receive more attention but are still inadequate. However, in fairness, it

should be pointed out that the author was aware of the omission of many applications and stated that he only included some general principles and methods to serve as guides in specific problems. While it appears that more applications could have been included without making the book too voluminous it is to the author's credit that he did not omit fundamentals for the sake of applications.

The appendix which lists a large number of commercially available emulsifying agents should prove most useful to the formulator of emulsion products.

The book will be valuable as a reference for courses such as physical pharmacy, pharmaceutical technology, and pharmaceutical dispensing in which emulsions are only one of many physical systems discussed. The book is too great in scope to serve as a text for the above courses but should serve very well as a text for a course dealing strictly with emulsion systems.

Dale E. Wurster
University of Wisconsin

Volumetric Analysis, Volume III, Titration Methods: Oxidation-Reduction Reactions, I. M. Kolthoff, R. Belcher, with the cooperation of V. A. Stenger and G. Matsuyama. Interscience Publishers, New York, New York, 1957. ix + 714 pp., 20 figs., 40 tbls. $15.00.

This is the third, and last, volume of reference works dealing with the principles and practical details of volumetric analysis. This volume is comprehensive in scope, covering the use of potassium permanganate, ceric compounds, potassium dichromate, iodine, potassium iodate, potassium bromate, periodate, and hypohalites as oxidants. One chapter is devoted to titrations employing Iron (II) and other reductants. Another chapter covers the use of the Karl Fischer reagent in the determination of water. To round out the volume, a section devoted to the use of miscellaneous reagents is included. Methods of analysis for both inorganic and organic substances are described.

The general principles governing the utilization of a given oxidant or reductant are discussed in detail, with extensive bibliographical references cited directly in each chapter. Details regarding the preparation of the volumetric solution and subsequent standardization are adequately covered, and include reactions involved.

Although an adequate and useful subject index and an author index are available, neither figures nor tables are indexed. The references are quite up to date with none later than 1956. These are derived from a wide distribution of available literature, both American and foreign journals being cited.

It is interesting to note the variations in the techniques of writing equations. The ion partial method would seem most useful, and is utilized in several chapters. It is somewhat disconcerting to come across equations which seem outmoded and are of little value in explaining a reaction. For example, one finds the following on pages 65-66:

> Permanganate in the presence of acid oxidizes thiocyanic acid according to the equation:
>
> $$HCNS + 3\ O + H_2O \rightarrow HCN + H_2SO_4.$$

Further on, on page 67, one finds the following paragraph:

> Stamm determines thiocyanate by oxidation with alkaline permanganate. The procedure is essentially the same as that described for iodide on p. 62, but see also the details given below for bismuth. One mole of thiocyanate requires 8 equivalents of oxidant:
>
> $$KCNS + 2\ O_2 + 2\ KOH \rightarrow KCNO + K_2SO_4 + H_2O.$$

This is somewhat baffling, because it is not easy to accept the statement made as to the equivalence on the basis of the equation as written. Writing this equation employing ion partials, the statement becomes perfectly clear.

Some few typographical errors occur, such as those on page 62, the negative sign being omitted from the formula for permanganate ion, while potassium ion appears on the right side with no potassium indicated on the left side. Despite the critical comments, the reviewer recommends this work as a distinct contribution to the literature of analytical chemistry. It should be made part of the library of every chemist for its excellence as a reference work. The authors have included extensive references to analytical methods as applied to organic compounds used in medicinal preparations, which should make this volume particularly useful and valuable to pharmaceutical chemists.

Samuel S. Liberman
Columbia University

Much is said about educational leaders, but they cannot accomplish all that they are capable of without the cooperation of the financial leaders.

William G. Crockett, Am. J. Pharm. Ed., 1, 416 (1937)

NEW BOOKS

General Diagnosis and Therapy of Skin Diseases, Herman Werner Siemens (translated from the German Edition by Kurt Wiener). The University of Chicago Press, Chicago, Illinois, 1958. vii + 324 pp., 375 figs. $10.00.

Biochemistry, Abraham Cantarow and Bernard Schepartz. Second Edition. W. B. Saunders Company, Philadelphia, Pennsylvania, 1957. xxviii + 867 pp., 151 figs., 77 tbls. $12.00.

The New Era in Medical Research, Douglas Williams Associates. Merck & Company, Inc. Rahway, New Jersey, 1957. 64 pp. Free (paper).

Introduction to Biostatistics, Huldah Bancroft. Paul B. Hoeber, Inc., New York, New York, 1957. x + 210 pp., 37 figs., 44 tbls. $5.75.

Biochemistry and the Central Nervous System, Henry McIlwain. Little, Brown & Co., Boston, Massachusetts, 1955. vii + 272 pp., 43 illus., 33 tbls. $9.50.

Dental Practitioners' Formulary, National Health Service. Rittenhouse Book Store, Rittenhouse Square, Philadelphia, Pennsylvania, 1957. 49 pp. $1.00 (paper).

The Neuroses and Their Treatment, Edward Podolsky. Philosophical Library, New York, New York, 1957. xiv + 555 pp., figs., tbls. $10.00.

Biochemical Cytology, Jean Brachet. Academic Press, Inc., New York, New York, 1957. xi + 516 pp., 190 figs. $8.80.

Chemistry of Carbon Compounds, Volume IV, Part A, Heterocyclic Compounds, E. H. Rodd. Elsevier Publishing Co., Princeton, New Jersey, 1957. xxvi + 807 pp., tbls. $28.00.

Mitotic Poisons and the Cancer Problem, John J. Biesele. Elsevier Publishing Co., Princeton, New Jersey, 1958. vii + 214 pp., 40 figs. $7.50.

Organic Colloids, Bruno Jirgensons. Elsevier Publishing Co., Princeton, New Jersey, 1958. xiv + 655 pp., 95 tbls., 160 figs. $16.75.

Surface Active Agents and Detergents, Vol. II, Anthony M. Schwartz, James W. Perry, and Julian Berch. Interscience Publishers, New York, New York, 1958. xv + 839 pp., figs. $17.50.

Pharmacology and Therapeutics, Arthur Grollman. Third Edition. Lea & Febiger, Philadelphia, Pennsylvania, 1958. 1034 pp., 191 figs., 33 tbls. $12.50.

American Drug Index, Charles O. Wilson and Tony Everett Jones. J. B. Lippincott Co., Philadelphia, Pennsylvania, 1958. 716 pp. $5.00.

Vitamins and Hormones, Vol. 15, Robert S. Harris, G. F. Marrian, and K. V. Thimann. Academic Press Inc., New York, New York, 1957. xi + 355 pp., tbls. $9.50.

A Manual of Paper Chromatography and Paper Electrophoresis, Richard J. Block, Emmett L. Durrum and Gunter Zweig. Second Edition. Academic Press, Inc., New York, New York, 1958. xi + 710 pp., figs., tbls. $12.80.

Manometric Techniques, W. W. Umbreit, R. H. Burris and J. F. Stauffer. Burgess Publishing Co., Minneapolis, Minnesota, 1957. iii + 338 pp., 80 figs., 37 tbls. $6.50.

Horticulture Laboratory Manual, Charles V. Hall. Burgess Publishing Co., Minneapolis, Minnesota, 1957. ii + 68 pp., 7 tbls., figs. $2.25 (paper).

Laboratory Manual for Vertebrate Physiology, Donald M. Pace, Benjamin W. McCashland, and Carl C. Riedesel. Burgess Publishing Co., Minneapolis, Minnesota, 1958. ix + 281 pp., 24 figs. $4.00 (paper).

The ABC of Acid-Base Chemistry, Horace W. Davenport. Fourth Edition. The University of Chicago Press, Chicago, Illinois, 1958. vii + 87 pp., 41 figs., 15 tbls. $2.00 (paper).

Drug Resistance in Micro-organisms — Mechanisms of Development, G. E. W. Wolstenholme and Cecilia M. O'Connor. Little, Brown and Company, Boston, Massachusetts, 1957. xii + 352 pp., 62 illus., figs., tbls. $9.00.

Modern Pharmacology and Therapeutics, Ruth D. Musser, Joseph G. Bird. The Macmillan Company, New York, New York, 1958. xiv + 828 pp., 19 tbls., 15 figs. $6.75.

Biochemistry of Some Peptide and Steroid Antibiotics, E. P. Abraham. John Wiley & Sons, Inc., New York, New York, 1957. xi + 96 pp., figs., tbls. $3.00.

1957-1958 Year Book of Drug Therapy, Harry Beckman. The Year Book Publishers, Inc., Chicago, Illinois, 1958. 518 pp., 39 figs., tbls. $7.50.

Biophysical Chemistry, Volume 1, Thermodynamics, Electrostatics, and the Biological Significance of the Properties of Matter, John T. Edsall and Jeffries Wyman. Academic Press, Inc., New York, New York, 1958. xv + 699 pp., figs., tbls. $14.00.

Progress in The Chemistry of Fats and Other Lipids, Vol. IV, R. T. Holman and W. O. Lundberg. Pergamon Press Inc., New York, New York, 1957. vii + 289 pp., figs., tbls. $12.50.

Biological Ultrastructure, Arne Engstrom and J. B. Finean. Academic Press, Inc., New York, New York, 1958. ix + 326 pp., figs., tbls. $8.00.

Methyl Glucoside, G. N. Bollenback. Academic Press, Inc., New York, New York, 1958. 183 pp., 12 figs., 66 tbls. $5.50.

Veterinary Anaesthesia, John G. Wright, The Williams & Wilkins Co., Baltimore, Maryland, 1957. xiii + 317 pp., 91 figs., tbl. $6.75.

Through Alchemy to Chemistry, John Read. The Macmillan Co., New York, New York, 1957. xvii + 206 pp., 49 figs. $3.75.

An Introduction to Medical Laboratory Technology, F. J. Baker, R. E. Silverton, and Eveline D. Luckcock. Second Edition. Butterworth & Co. (Publishers) Ltd., London, England. xiv + 408 pp., 118 figs., 13 tbls. $4.90.

New and Nonofficial Drugs. J. B. Lippincott Co., Philadelphia, Pennsylvania, 1958. xxx + 645 pp. $3.35.

Hormones in Blood, Volume XI, G. E. W. Wolstenholme and Elaine C. P. Millar. Little, Brown and Co., Boston, Massachusetts, 1957. xii + 416 pp., 74 illus., figs., tbls. $9.00.

A History of Nutrition, Elmer Verner McCollum. Houghton Mifflin Co., Boston, Massachusetts, 1957. x + 451 pp., tbls. $6.00.

Scientific Russian, James W. Perry. Interscience Publishers, Inc., New York, New York, 1950. xxix + 816 pp. $7.50.

The Medical World of the 18th Century, Lester S. King. The University of Chicago Press, Chicago, Illinois, 1958. xvii + 346 pp. $5.75.

Introductory Physics, Herbert Priestley. Allyn and Bacon, Inc., Boston, Massachusetts, 1958. xviii + 515 pp., figs. $7.50.

British Pharmacopoeia 1958, British General Medical Council. The Rittenhouse Bookstore, Philadelphia, Pennsylvania, 1958. xxvi + 1012 pp. $9.50.

The Physical Chemistry of Electrolytic Solutions, Herbert S. Harned and Benton B. Owen. Third Edition. Reinhold Publishing Corp., New York, New York, 1958. xxxiii + 803 pp., figs., tbls. $20.00.

5-Hydroxytryptamine, G. P. Lewis. Pergamon Press, New York, New York, 1957. xvii + 253 pp., figs., tbls. $9.50.

Psychotropic Drugs, S. Garattini and V. Ghetti. Elsevier Publishing Co., Princeton, New Jersey, 1957. xiv + 606 pp., figs., tbls. $19.50.

Methods of Biochemical Analysis, Volume 6, David Glick. Interscience Publishers, Inc., New York, New York, 1958. ix + 358 pp., 16 figs., tbls. $8.50.

Dictionary of Microbiology, Morris B. Jacobs, Maurice J. Gerstein and William G. Walter. D. Van Nostrand Co., Inc., Princeton, New Jersey, 1957. 276 pp. $6.75.

Principles of Chemistry, Donald C. Gregg. Allyn and Bacon, Inc., Boston, Massachusetts, 1958. xx + 600 pp., figs., tbls. $6.50.

Expert Committee on Addiction-Producing Drugs, Eighth Report. World Health Organization, Geneva, Switzerland. 12 pp. $0.30 (paper).

MISCELLANEOUS

Liberal Education and American Pharmacy: A Bibliography, Kevin P. Bunnell and other members of the Institute staff. The Institute of Higher Education, Columbia University, New York, New York, 1958. 18 pp. mimeographed sheets. Free.

Use of Specifications for Pharmaceutical Preparations, Report of a Study Group, Series 138. World Health Organization, Geneva, Switzerland, 1957. 29 pp. $0.30 (paper).

An Inventory of Social and Economic Research in Health, Odin W. Anderson. Sixth Edition. Health Information Foundation, New York, New York, 1957. 327 pp. Free (paper).

From Wortcunning to Pharmacognosy, G. E. Trease. The Registrar, The University, Nottingham, England, 1957. 20 pp. $0.30 (paper).

FELLOWSHIPS IN PHARMACY

To meet the demonstrated need for qualified teachers and researchers in the field of pharmacy, the American Foundation for Pharmaceutical Education announces a limited number of fellowships for students seeking graduate degrees in pharmaceutical subjects.

These fellowships are open to students (men and women) qualified for registration in approved graduate schools or colleges for one or more of the following major fields:

PHARMACY

PHARMACEUTICAL CHEMISTRY

PHARMACOLOGY

PHARMACOGNOSY

PHARMACY ADMINISTRATION

(or closely related subjects)

The Foundation offers Teaching Fellowships in Business Administration, in cooperation with colleges of pharmacy. Deans have full information on these awards. Applications must be made jointly by individuals and their colleges.

Pfeiffer Memorial Postdoctoral Research Fellowships are available to college of pharmacy faculty members.

For application forms or further information write to

W. Paul Briggs, Secretary

AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION

1507 M Street, N.W. **Washington 5, D.C.**